GAMES for Inclusion and Learning

Funded by the Erasmus+ Programme of the European Union

Contents

Background

The idea behind this project stems from the belief that technology has the power to empower, support and transform education. Yet, it is not technology per se that truly helps improve learning outcomes. It needs to come from the pioneers that work with young people and their pedagogical approach to learning. Similarly, we know that children love playing games, as this is something they naturally do and naturally learn from. Yet it is not simply playing digital games that leads to enhanced learning outcomes either. Combining the two ideas was what prompted this project:

The GAMES for inclusion and Learning project aimed to develop innovative teaching methods involving making and playing games to support learning and involve all students including those with special education needs.

This project built on existent approaches in the partner countries by extending and exchanging pedagogic knowledge and expertise and developing new learning paths specifically through making games and then playing them. It aimed to:

- Develop teachers' skills to take innovative appraches in teaching.
- To show the benefits on pupils using digital games as a tool to create artefacts both individually and collaboratively.

Through a series of case studies based in classrooms in the UK and Sweden, GAMES for Inclusion and Learning aimed to develop teachers' as well as students' skills. The teachers collaborated and exchanged knowledge and expertise in using games in diverse settings and with pupils of around 10 years of age (upper primary) in a mainstream (Sweden) and a SEN school (UK).

This web-based project report aims to share materials in order to promote and support the use of games in education. (http://www.gamesforlearning.se)

Led by Buckinghamshire County Council, in the UK, the project collaborated with the University College of London Institute of Education and Stony Dean School in Amersham, Buckinghamshire. In Sweden Gothenburg Region Utbildning worked together with the Interactive Institute and Lexby school in Partille, Gothenburg. The project was supported by the European Commission's Erasmus + program and ran from September 2015 – August 2017.

MOTIVATION, AIM AND SCOPE OF PROJECT

While a large body of research exists on the topic of learning technologies from a variety of disciplines, there is still lack of classroom based evidence which describes and evaluates their use. There is a growing understanding of the needs of learners and the capabilities of technologies, and there is more specific evidence of benefits that technology can have to learners with special educational needs.

Teachers are therefore required to update their skills, including programming skills and to use innovate methods to teach and one of these methods is to use digital games.

CONTEXT AND RESEARCH

Information and Communication Technology (ICT) has impacted contemporary society, including education and schools, where technology has been used as part of the teaching and learning process for many decades. There are several technologies, which although not developed for educational purposes, are increasingly used in present-day schools (Flewitt, Messer, & Kucirkova, 2014, Ditzler, Hong, & Strudler, 2016, Ren, 2014).

Digital technologies have influenced pedagogies and environments for learning. Learning experiences can become more flexible, interactive, collaborative and multimodal (Churchill, Fox & King, 2012; Kress & Pachler, 2007). These technological innovations have also provided learning opportunities for students who need additional support in the classroom, and students with special educational needs (SEN) (Florian & Hegarty, 2004). There is an emerging broad consensus worldwide about the benefits that can be brought to school education through appropriate use of technology, however, research also indicates that unless merged innovatively into classroom practice, they may be little more than devices which deliver repetitive curriculum content (Loveless, 2010, Flewitt et al., 2014).

Digital inequality takes the form of exclusion not only in terms of not having access to equipment but also in the low level of autonomy, skills and support provided to those who are marginalised. Those persons with Learning Difficulties and Disabilities (LDD) who often lack this autonomy are particularly hard hit. Research has shown that technology can have a positive effect, both in terms of engagement and learner outcomes at cognitive, social and emotional levels. However, investigations regarding the process by which technology supports positive outcomes for capacity building (and training) are rare.
As in mainstream schools, teachers of young people with LDD can benefit therefore from alternative pedagogic approaches.

SPECIAL EDUCATIONAL NEEDS AND GAMES IN EDUCATION

Although video games and other digital media display the capacity to capture the mind of children with attention problems, it is not sufficient to propose them as a 'treatment'. Parents and teachers of children with attention problems , for example, almost universally agree that these children can easily sustain their focus while playing video games, surfing the Internet, or using other digital media. Games (mostly puzzles and short action games) have been proposed in various sites for the range of neurological deficits a child may present. (e.g. http://learningworksforkids.com/adhd/) however these are simply exercises mostly targeting skill remediation.

Beyond enhancing learning for literacy and basic life skills, digital games can promote different paths to succeeding in more creative ways. There is evidence to suggest that successful entrepreneurship is more common amongst individuals with dyslexia and other learning disabilities than in the typical population. Individuals with language difficulties may learn differently leading to more creativity, they may have to work harder, develop compensatory skills, and be more persistent and they tend to effectively delegate authority and have excellent skills in oral communication and problem solving.

http://www.nytimes.com/2007/12/05/business/worldbusiness/05iht-dyslexia.4.8602036.html?_r=1&

Another body of research focuses on ***Minecraft*** is a video game designed by a Swedish game designer and now owned by Microsoft as it became the most successful game after Tetris. The creative and building aspects of *Minecraft* enable players to build constructions out of textured cubes in a 3D generated world. Other activities in the game include exploration, resource gathering, crafting, and combat; they can be played online and off and have seen many children playing it in schools as well as at home. Some examples focusing on both learning outcomes but also collaborative skills are given in the blog below:

https://www.edutopia.org/blog/minecraft-in-classroom-andrew-miller

Another way to think about online games is highly successful virtual reality game "Brigadoon" which is described as a real-world experiment in social skills made virtual, a private enclave limited to a select mixture of caregivers and individuals with Asperger Syndrome (ASD), a higher functioning form of autism. The inhabitants, or "Dooners" as they call themselves, enjoy the same privileges as those in the more public arenas

of "Second Life." They are free to create their own digital representations of themselves, called "avatars," build virtual houses and seek out friends. And, most importantly, they are free to create a "second life" with a level of social interaction that, for reasons of their condition, has been hard to come by in their real lives.

(http://www.nbcnews.com/id/7012645/#.U1UB8sfc3Rw).

Far from being harmful to young people, these games have shown to promote valuing the skills they already possess and allowing them to find their own ways into communication at the same time as allowing teachers, parents and the rest of their world to understand them.

LEARNING AND GAMES

Teachers have been experimenting with the use of games for a while and focused on in this project was to investigate the challenges in implementing this use both in mainstream as well as in SEN classrooms and to understand what it takes to convince teachers and middle managers to use it.

It was important therefore to establish how digital games can be used to allow for this understanding to occur and to enhance some of the learning processes for the target population.

For example, a recent study found that dyslexic children who trained on action video games showed significant improvements on basic measures of both attention and reading ability, suggesting future directions for the study of dyslexia intervention paradigms (Bavelier et al. 2013).

The game creation process involves many underlying processes and allows many skills to be developed and not just coding or programming skills. The main focus is on learning, not on the technology per se, and the pedagogies are based on psychological processes including motivation, communication, collaboration, self-regulation and utilising working memory.

Specific interests of the child are encouraged when considering the context of the game to be made, and some of the following learning and teaching principles are involved:

- Instantaneous feedback
- support for sequencing
- overcoming anxieties
- accepting failure/making mistakes
- producing an artefact
- motivation and self regulation
- confidence and learner autonomy
- feelings of independence
- taking turns to work together
- working at the right pace
- passive as well as active learning
- variety of learning approaches and of tools
- taking risks
- problem solving and
- debugging

and more....

Based on these principles and processes, which were identified in the case studies described by the participating teachers, we aimed specifically to draw some practice-based lessons learned.

ASSESSMENT OF GAMES AS PART OF THE CURRICULUM

The implementation of the game Scratch in the syllabus are in line with the Swedish curriculum for the compulsory school, preschool class and the leisure time centre 2011. Therefore, it can also be assessed on three levels according to the Swedish Curriculum (1):

- Pupils can produce some types of narrative and informative pictures that communicate experiences and views using a **simple** visual language and partly developed forms of expression to communicate a message.
- Pupils can produce some types of narrative and informative pictures that communicate experiences and views by applying a **developed** visual language and relatively well developed forms of expression to communicate a message.
- Pupils can produce some types of narrative and informative pictures that communicate experiences and views in a **well developed** visual language and well developed forms of expression to communicate the message.

HOW TO SCALE THE PROJECT: MAKER EDUCATION

The ideas behind the project were influenced by the current trends on Maker education:

Every child a maker – http://makered.org following the idea that if pupils are makers they are more actively engaged. In this project, such making is facilitated by computer programming to create and play digital games (produce artefacts).

Maker Education is associated with STEM (Science, Technology, Engineering, Mathematics) or STEAM (Science, Technology, Engineering, Arts, Mathematics) learning. Its often based on learning that relies upon hands-on, often collaborative, learning experiences as a method for solving authentic problems. People who participate in 'making' often call themselves 'makers'. In schools, maker education is often associated with the notion of "failing forward," or the idea that mistake-based learning is crucial to the learning process and eventual success of a project.

Since 2005, Maker Education has gained momentum in schools around the world and has gathered academic interest. Paulo Blikstein of Stanford University and Dennis Krannich of the University Bremen, in Germany, state that, "Digital fabrication and 'making,' and the positive social movement around them, could be an unprecedented opportunity for educators to advance a progressive educational agenda in which project-based, interest-driven, student-centered learning are at the center stage of students' educational experiences."

Maker Education is gaining momentum in Sweden with the following initiatives:

Makerskola (http://makerskola.se/about-our-project/)

This project has seen good results in designing distributed learning models, where teachers collaboratively learn on specific subject matters. In situations where much new knowledge is needed, such as in the implementation of new curricula, such methodology for teacher training seems to be particularly valuable.

MakerDays

With its third year coming, MakeDays is a Swedish conference and workshop series where teachers and school management learn about pogramming, games, maker culture and associated domains. An annual gathering on a common topic builds community, spreads knowledge and strengthens active schools.

Google Hangouts

These can be used to facilitate training/meeting between colleagues. In the Makerskola project, teachers from different schools have joined together in facilitated google hangouts, in which they collaborate and share. Here technology is important, but the facilitation and organisaton of the activity is even more important, and something that teachers themselves have a hard time managing.

What We Did

SCHOOLS WHICH TOOK PART

STONY DEAN SCHOOL, AMERSHAM, UK

Stony Dean School is an Ofsted rated Outstanding and has SEN College status, with a designation for Communication and Interaction. The school follows an adapted national curriculum for pupils aged between 12-19 years old. The schools main focus is supporting pupils communication and interaction skills, independence and employability skills. The school uses a variety of strategies that's are based upon theatrical researched based studies. These strategies are aimed at supporting pupils with Autism and communication and interaction difficulties. To improve pupils ability to access the curriculum interventions are used to augment the curriculum for its pupils, including using schedules (overviews of lessons for pupils) and Communicate in Print. Classes were organised into the differing needs of pupils. It was important that the school were able to trial different interventions with differing pupil needs to be able to provide a comparable experience for the study.

http://stonydean.bucks.sch.uk/

LEXBY SCHOOL, GOTHENBERG, SWEDEN

Lexby School is one of eleven municipal elementary schools in the municipality of Partille, outside Gothenburg, for students from grade 6 through 9.

The school's value base rests on the responsibility, security and well-being. "Responsibility" emphasizes the importance of being jointly responsible for ensuring that everyone is well and taking responsibility for their learning. "Security" implies that everyone should feel safe and welcome at school and to accept each other's differences. "Well-being" refers to the positive atmosphere in school and partly because it will be more fun to learn.

Students' learning is in focus and focuses on basic knowledge and on deepening it to enable all students to develop at their own pace. The school works to provide all students with a modern learning environment both in terms of work and IT, which means that every student has access to a computer.

The team involves Erik, who is a mathematics and PE teacher and has good ICT skills. He often uses technology to enhance learning of students particularly in maths and is keen to support others too: Linda is a Swedish language teacher, Sara teaches Swedish and ICT and Paola teaches spanish. All 3 agree to be mentored by Erik in using Scratch to design games with learning outcomes linked to their subjects.

https://sites.google.com/site/lexbyskolan/

AFRISTON SCHOOL, BEACONSFIELD, UK

A school for girls with special educational needs. The teaching group used for the case study were 12 pupils aged 15/16. All have a diagnosis of moderate learning difficulties. Some have a diagnosis of SLCN and/or ASD. They have one lesson of computing each week. Mr O is the classroom technician.

www.alfristonschool.com

HUGHENDEN PRIMARY SCHOOL, HIGH WYCOMBE, UK

A mainstream primary school, where students include some with learning difficulties, behavioural issues etc

http://www.hughendenprimary.co.uk/website

FURZE DOWN SCHOOL, WINSLOW, UK

Furze Down School is a co-educational special school in Winslow, Buckinghamshire. It is a community school, which takes children from the age of 5 through to the age of 19.

http://www.furzedown.bucks.sch.uk/

Case Studies / Findings

ICT WITH STUDENTS WITH SPECIAL EDUCATIONAL NEEDS (STONY DEAN)

Tom , Stony Dean's ICT Coordinator and teacher, introduced a variety of students aged 14 years old with High Functioning ASC, Motor difficulties / processing, physical impairment, ADHD and moderate learning difficulties to programming.

Pupils were given 2x 6 week introductory projects using Kodu and Scratch. This involved all pupils creating the same game with the same controls but with different race courses/backgrounds. This allowed pupils to become familiar with the layout, tools and controls, so they did not become frustrated when it came to designing their own game as they had that prior knowledge. They were then given the choice as to which they preferred. The majority chose Kodu because the visual programming elements of Kodu and its immersive 3D environment lend themselves exceptionally well to game design. The visuals also helped with some of the students short term working memory as the coding tasks were reinforced. Visuals were created in "Communicate and Print"© in order to help pupils with low levels of literacy and communication difficulties. The visuals supported the language comprehension of the technical ICT language pupils were newly exposed to. It reduced the levels of anxiety and low self esteem by allowing pupils to associate the image with the word. (E.g.)

A booklet was produced in a way that allowed pupils to follow a path of knowledge, with work being deconstructed into smaller achievable tasks, then eventually building up to complex design features. By keeping tasks small, simple and achievable pupils felt motivated and happy that they were able to achieve something.

Schedules were included to reduce anxiety and the need to know what their next task was and keep pupils focused on their task. Some pupils like the satisfaction of ticking off a box when they know they have completed the work, this gave them a sense that they have achieved something and you can say "I've done it".

Obstacles

- ***Technological Difficulties*** – You can never rely on technology!
- ***External factors*** – The pupils at school run into an infinite number of factors throughout a normal day, and each incident/factor/moment can change the way a pupil will learn/act/behave. These could be bullying, pressures from other lessons, changes in a routine, going to bed at 1:00am, not having breakfast, issues with transport, falling out with siblings or parents, lack of support, equipment not working. As you can see, these all have to be dealt with at the classroom door before any teaching can take place.
- ***Time/Timetable*** – Pupils will only be given 50 minutes of ICT a week and with quite a small timescale in place, there is a possibility that there could not be enough time.
- ***Absences*** – Pupils could miss lessons due to illness, appointments, transport or annual reviews. Pupils will have to be given time to catch up, possibly during the school GOAL timetable lesson or during

lunch. It is also important to have consistency and regularity of the same staff teacher, teach the same course material.

- ***Pupils needs/levels of access*** – Pupils may find the work hard and have to be taught the course material in a differentiated way from others in their class therefore reducing the amount of time the pupil will have to plan, design and create their game.

Learning Outcomes

This project was highly successful for the pupils and staff.

Pupils who took part in the study are using their new found skills to work and interact positively with each other.

Other unexpected skills that have been evidenced by pupils are; Teamwork, Problem Solving, Patience and their use of expressive use of language.

The skills/lessons/resources can be used in any school across all abilities and adapted to the individual needs of your class/pupil. They offer the foundations for learning and understanding the concepts of game creation/designing and planning.

All pupils created a game, developing computer programming skills but also crucial life skills, including teamwork, patience, communicating through expressive language and taking pride in positive interactions. Individual pupils described how they felt they had learned programming skills, improved communication and developed problem solving strategies.

There was excellent engagement from pupils taking part in the project – when recording behaviour, one case study pupil showed a dip from 7 per week to 3 per week of inappropriate interactions. Another pupil moved from an average of 12 behaviour incidents per week to 2.

Pupils benefitted from communication skills, with pupils benefitting so much from collaborative learning and discussion.

Student Feedback

“I learnt to work as part of a team”

” I improved my communication skills by helping others out”

“I learnt how to communicate with my peers”

“I learnt how to solve a problem”

Staff Feedback

“**This is a major breakthrough for the pupils as a large majority of them struggle within a social setting**. The fact that they can independently and confidently help their peers and be able to use and improve their communication skills is superb.Surprisingly there was not a large amount of technological difficulties encountered, although I do think the pupils have finally copped onto the idea of ‘turning it off and on’. I think that external factors did play a major role in this project. Often I had to intervene with problems that had happened outside of lessons to ensure that they had a positive learning experience.”

Resources Used

- See Toms Blog for a reflective diary describing how he set up the project within the one ICT session per week. How he chose the classes and his thoughts before and after sessions. https://mrbgamesproject.wordpress.com/
- Toms Booklet can be downloaded here
- PowerPoint presentation
- links to the paper in SPECIAL CHILDREN

LEGO BASED THERAPY (NON DIGITAL GAMES) WITH STUDENTS WITH SPECIAL EDUCATIONAL NEEDS (STONY DEAN)

Huda, a speech and language therapist, is passionate about the power of using Lego and other games to give pupils with SEN confidence, and in developing pupil skills in turn taking and non-verbal communication. Working in Stony Dean School Huda's students include 3 groups; those with High Functioning ASD, Motor difficulties/processing difficulties/physical impairment, ADHD and moderate learning difficulties.

Highly familiar and motivating games including Hedbanz, Yes/No, Wink Murder and Uno are routinely used, with a focus on social interaction, including sharing, turn-taking and waiting. Expressive and receptive language are employed, with opportunities for problem solving and prediction.

Lego- Based Therapy is effective for developing team work, verbal communication (focusing on descriptive skills, positional language and positive verbal communication), listening skills and visualising. Peer reviewed evidence (LeGoff, 2004) has shown how Lego-based therapy can improve motivation, social interaction skills and autistic traits of "aloofness and rigidity".

With Lego-based therapy, pupils are organised into groups of three, with each pupil assuming one of the roles below:

- Engineer – has instructions
- Supplier – in charge of bricks (perhaps best for most anxious child)
- Builder – most popular – builds the model following instructions from the engineer.

Student Profiles

Group 1: Majority ADHD, all have a diagnosis of learning disabilities. Some have a diagnosis of ASD, and some also have sensory difficulties.

Group 2: All have diagnosis of moderate learning disability or ASD as well as additional needs including motor difficulties, processing difficulties, and physical impairments

Description of learning prior to the project start

All were used to developing aspects of language through the use of games e.g. asking question in Hedbanz, categorisation games in 'pass the bomb' etc. All pupils had pre-teaching at the start of every session on key language used e.g. descriptive and positional language.

Obstacles

- Lego had not yet been a tool used in pupil teaching over their 2 years in Stony Dean and some pupils in Group 2 had never played/used Lego at home.

Description of students during the project

Group 1:

- *Social development* – all began to support each other, but were choosing favourite pupils to work with.
- *Language development* – increased confidence in using the terminology and were beginning to use "own language" e.g. coming up with new vocabulary and beginning to rely less heavily on the visuals that had been in place.

Group 2:

- *Social development* – struggled with the 'mechanics' of the building as many had not used Lego before, but within this they began to pick out their strengths and support peer 'weaknesses'
- *Language development* - developed confidence in using the language and began to increase their sentence structure with visual in place

Learning Outcomes

Other skills that pupils completing Lego-based therapy have developed include (all within the therapy lesson):

- increased verbal and written language – in relation to task
- increased self esteem
- tolerating of peers
- emerging compromise skills
- turn taking
- more positive language used in groups

Group 1:

- *Social development* – All were choosing their own groups and no –one was being left out. Tolerance of each other had increased and they were all waiting for each other.
- *Language development* - All conversational language within the building had improved and included more descriptive and clear instructions as well as supportive language. Some were beginning to ask questions to peers in order to gain more information.
- Increased self-esteem and confidence
- Increase in more detailed descriptions
- *Increase in waiting time* – the pupils became more resilient to waiting for their peers and became more supportive with peers.

Group 2:

- *Social development* – Asking each other more questions and working more cohesively than at the start, however not as noticeable an improvement in comparison to the other group.
- *Language Development* – huge increase in their confidence in using the language more independently and extending sentences e.g. most increased their sentences length from 1 key word "the blue piece" to at least 3 key words without the use of additional visuals e.g. "the blue, 2 dot, flat piece" Like the other group they also began asking for clarifications in more socially appropriate ways and using clearer language whilst doing that.

- wanted to engage in playing with Lego and on the final week 5 out of 8 pupils asked to take a bigger model back to class to complete

Revisit with Group 2, 8 months later:

- Pupils were able to recall vocabulary and had a wider range of vocabulary than previous year
- Pupils showed some emerging higher level social skills – negotiating, compromise, ask for clarifications, predict next steps, managing group roles with independence, working with peers they would not usually work with/struggled to get along with
- Developed language skills - supporting each other with vocabulary e.g. when asking for clarification asking "is it the stepped one or the sloped one?"

Student Feedback – 8 months later

The group asked to create booklets to support younger classes, and to show their vocabulary in writing as well as their verbal vocabulary.

Resources Used

- Lego
- Lego instruction packs
- Word mats – commonly used words were all on a mat to support pupil recall of language
- Colourful semantics – simply used to word web as a starter task

ENGLISH STORY TELLING WITH STUDENTS WITH SPECIAL EDUCATIONAL NEEDS (FURZE DOWN)

Emma is a female student aged 16. Emma's primary need is ASD with comorbidities in ADHD; Emma also has speech, language and communication needs. Emma finds focussing on tasks for more than a minute or two very difficult.

Whilst Emma had previously developed basic skills in sequencing instructions using Scratch, Emma was a reluctant user. In discussion, Emma indicated that she was uninspired by the programming experiences she had previously experienced, expressing frustration with the tasks she was asked to complete and the complexity of the interface in Scratch. On further questioning, Emma indicated that the tasks previously completed during lessons using Scratch involved copying teacher demonstrations, with outcomes that didn't mean a great deal to Emma; Emma cited an example where she had to program a timer to count from 0 to 10 – Emma didn't understand why a stop watch couldn't be used instead.

Description of student during the project

At the beginning of the game making project, Emma responded positively to the scenario of making a game for a real life client. The intention of the scenario was to give Emma a purpose for her endeavours, with a real focus for her efforts.

Emma had a meeting with the client, discussing the requirements of the game, including the intended audience and purpose. The client outlined how a game based on the movie 'Edward Scissorhands' was required; the choice of movie was intentional, with the client aware of Emma's love of the movie. Emma was

very excited at the prospect of creating an Edward Scissorhands game, readily sharing lots of ideas that she had about a subject that was so important and meaningful to her.

Following the initial meeting with the client, Emma then proceeded to make the game using Scratch. Emma responded positively to using a range of pre-made tutorial video clips (links to resources below). Watching Emma use the video clips was revealing; unlike a traditional teaching sequence where a teacher demonstration is often followed by a student's attempt at a similar succession of skills, use of the video clips allowed Emma to personalise the learning experience, choosing the video clip to watch matched to the particular requirement of the game. Emma also regularly paused the video clips to give herself time to apply the skill in Scratch, re-watching the clip if necessary. Emma described how using the videos clips felt less stressful, and it was good not to have to remember so many things at once.

Whilst making the game, Emma was able to work creatively, enjoying the freedom of designing her own backgrounds and sprites, without the constraint of 'on rails' programming tutorials that Emma had lacked any interest in previously. Such engagement led to prolonged periods of focus from Emma, working for periods of up to 20 minutes without the need for prompting. Having the option of recording sound effects in Scratch to add interest to the game also allowed Emma to maintain interest. Emma discussed the project frequently with her classmates, discussing the content of her game and even the algorithms to achieve certain character interactions.

Changes identified

- *Social development* – during the period of the project, Emma showed a noticeable improvement in her engagement with her learning, regularly discussing the project with the client and her peers. The project facilitated a large number of social interactions, helping Emma to gain confidence in working with her peers.
- *Language development* - due to the higher levels of engagement with Scratch, Emma made significant gains in her skills in programming and game development; consequently, Emma was frequently using language linked to the project such as 'sprite', 'sequence' and 'debug'.

Description of learning after the project including any related outcomes

On completion of the game, Emma presented her final work to the client, receiving positive feedback. Emma was delighted to have made something to feel proud of, proudly sharing her achievements with her peers and parents.

Emma applied the learning from this project to other projects, having gained so much confidence from making the game, both in terms of technical skills and social skills in working with her peers.

Lessons Learned :

Using **special interests**, in this case the movie 'Edward Scissorhands', the teacher was able to engage the pupil and increase their attention span. He was also able to motivate her by turning the design of the game into as **real life task** by presenting it as a job for a real client.

Increased self esteem led to better learning outcomes and in particular **transfer of learning** as Emma applied the learning from this project to other projects, having gained so much confidence from making the game, both in terms of technical skills and social skills in working with her peers.

The teacher was able to link up his work with other teachers and as a team they could find a common thread linking Emma's learning outcomes into a **cohesive learning path personalised** and **spanning several subjects**.

Resources

Scratch

Video clips

- o https://www.youtube.com/playlist?list=PLpUPrlm30ZccDmFVuJ1S7gG4Mk-Wh7H23
- o https://www.youtube.com/playlist?list=PLpUPrlm30Zcc_eNFK8aKQTHz_V4NwZzzu

Scratch planning and video clips

- Storytelling with Scratch - https://drive.google.com/drive/folders/0B_jbaWD9HEecSGtVSmxrd2t5d2M
- Making Games - https://drive.google.com/drive/folders/0B_jbaWD9HEecNFB1UlhsVU5zclE
- Graphics and user interfaces - https://drive.google.com/drive/folders/0B_jbaWD9HEecX2l4dG9OeHBVLTg
- Working with variables - https://drive.google.com/drive/folders/0B_jbaWD9HEecT2ZJazNzandnQkE

CODING WITH STUDENTS WITH SPECIAL EDUCATIONAL NEEDS (ALFRISTON)

Previous learning in respect of game design and making had been through the use of 2Simple's software 2DIY when pupils had created a simple collecting game. They had been introduced to Scratch or similar block coding during Hour of Code activities.

My previous experience both with this group, and of using Scratch with a different year group, was that the girls tended to get bogged down in the decision making around design elements rather than the logistics of a game. The project was structured to take account of this.

1. Familiarisation with Scratch. Play existing games. Look inside.
2. Mastering skills. Change the context/background of the games played.
3. Mr O explains a game he has designed and some of the finer points of his code. Pupils personalise the game. Change the sprite and adjust the coding.
4. Pupils encouraged to create their own games: collecting game or maze game. (limited choice and decision making)
5. Share the game with a friend. Peer evaluation and refinement.

Description of students during the project

All pupils enjoyed exploring Scratch and were able to practise their skills in using Scratch quite quickly. They were buoyed by the simplicity of changing the context and enjoyed creating humorous or unusual backgrounds.

They were impressed that they were able to find Mr O's game on the Scratch website and enjoyed talking to him about the game which they liked a lot. When they started to personalise the game, they enjoyed tapping into his expertise and a number of girls were genuinely interested in his decision making. A few girls were inspired and had very clear ideas of their own and a desire to develop quite sophisticated details into the game. Others were less so and a few were happy to stick with just tweaking existing games.

The interaction between the girls who had become enthused with the project was good and they were sharing ideas, skills and knowledge quite readily. The others remained quite timid and benefited from adult input to

help them maintain focus and help them develop even simple ideas. Some girls were not keen to share their work but all the girls enjoyed looking at the work of their peers.

The three girls in the group with the most pronounced autism were the same ones who were most reluctant to fully explore features of Scratch projects and the ones who found it hardest to initiate any personalisation of Mr O's game.

Changes identified

- *Social development* – during the period of the project, most of the girls displayed a good level of engagement with the learning; some of them working on their games at home or in their own time at school. This was quite unusual for these girls who would not normally admit to enjoying their work nor doing extra work at home! Within the lessons they were widely animated in discussing and sharing ideas both with adults and peers.
- *Language development* – All pupils showed improved confidence to use the language associated with Scratch such as 'sprite', 'stage' and 'script' and 'costume' and the most engaged were able to talk confidently about the different blocks available to them.

Lessons learned

- By using an existing game as a sandbox to work on and 'correct' the girls were more confident in tackling their own new games.
- The teacher took the risk and was rewarded with the surprising reaction of these girls who 'would not normally admit to enjoying their work nor doing extra work at home'. By making the game a 'cool' thing to do, she not only increased their motivation but also vocabulary.
- It is a good idea to prepare a template of a game for those who are beginners or who seem not interested in continuing with the task so as to bring them to a more interesting step forward.
- to invite the others to elaborate more on Scratch either through internet or via the teacher.
- Not all pupils are equally ready to accept new projects/criticism etc but most are interested in peers' work. Allow for diversity through making each level a separate goal so it feels achievable,
- Evaluation skills are higher order and therefore we would expect them to be the most difficult to achieve.
- Pupils were able to save their work and to share it on the Scratch site.
- Mature use of coding language/new vocabulary
- Confidence to seek advice and take criticism
- Better idea of what makes a successful game
- Improved evaluative skills

Future Plans

Pupils will now go on to explore game-making using Kodu

Resources

Scratch online: https://scratch.mit.edu/

Mr O's game: https://scratch.mit.edu/projects/158955270/

A remix by one of our pupils: http://www.2simple.com/

STORY TELLING IN A MAINSTREAM SCHOOL (HUGHENDEN)

Our target group contained seven children, three boys and four girls aged between 10-11 years old. The group all presented as SEN children with significant barriers to learning surrounding both their reading and writing.

One of the main outcomes which we focused to improve upon was the children's struggle to begin their writing and finding appropriate and interesting vocabulary when forming their ideas.

Many of the children in the group are registered as dyslexic and all have dyslexic tendencies. These tendencies present as having trouble with the sequencing of ideas and the writing of imagined scenarios, particularly in areas such as story writing.

Obstacles

Areas of challenge that the children face include:

- the putting of their thoughts into words;
- short attention spans which results in children losing their train of thought;
- the making of key word notes in the planning stage of their work;
- managing deadlines to complete their writing;
- fatigue surrounding the task as a result of the extra concentration and energy needed to meet both the literacy and non-literacy requirements; and
- limitations in working memory

Many of the boys in the group also present with disruptive, attention seeking behaviour during extended writing sessions. This stems from their barriers and in some cases their other registered disabilities such ADHD.

The writing from the children in this group tends to be limited in content and disjointed in terms of its chronological organisation.

Description of learning prior to the project start

During this project, we focused on the children's ability to write extended pieces of imagined stories. The pieces of work focused on several lesson objective projects:

- An imagined recount of themselves as a refugee in an inflatable life raft making their way to another country by sea.
- A ghost story taking place at Calshot spit (where their residential trip took place).
- An imagined recount from a day in life of a WW2 solider.

Using the visual programming tool, KODU, the children in the targeted group were given the opportunity to 'plan' the settings for their writing by designing them using the KODU tool. They were given an opportunity to research their settings online and then sculpt their environments using the KODU programme. The children then used a screen grabbing tool to create a PowerPoint presentation using several angles of their environment. They were the given opportunity to label different aspects of their 3D environments -using online thesauruses – within their presentations. This provided those children within the target group a significant resource from which to draw their ideas from.

Description of students during the project:

- engagement was higher than normal

- significant improvement in children's ability to stay on task for longer periods of time. Childrens engagement increased from 15 minutes to more than 35 minutes.
- better communication of ideas and plans to peers as well as to supporting adults, once they had completed their 3D planning. Children took advantage of the 'tracking/roaming tool' within the KODU programme and were able use it to identify a series of events that they would describe in their writing i.e. first of all they were out at sea and then later on they were moving up the beach and inland.
- more confident and willing to begin their writing and showed greater levels of determination in completing their set task.
- increased productivity,
- Improvement of descriptive quality of the writing, with children labelling their environment using their own lexicon first and then modifying using online tools later.

Changes identified:

During and after the project the following changes were noted in the children's attitudes and work:

- Increase in overall engagement in their writing
- Increase in time spent on task
- Increase in the volume of work produced
- Reduction in the time it took to settle down to the writing task
- Reduction in support required to help children form their work
- Improvement in children's ability to link, chronologically, as series of events and ideas
- Improvement in the levels of description and atmosphere in children's writing

Description of learning after the project including any related outcomes:

Through several independent pieces of writing, children demonstrated that using gaming tools such as KODU, improved their work and attitude significantly. The child lead nature of the project meant that children felt they had greater ownership of their learning and were better able to formulate there unique ideas when supported by this program.

We found that those children who presented with word finding and sequencing issues had their barriers significantly reduced and the overall time it took them to produce work- to high standard- was significantly reduced.

Using the programs roaming tool - in combination with PowerPoint - also provided the children with simple and effective way to plan the sequencing of their ideas with a greater level of annotated setting descriptions.

We also found that children's over all engagement with their writing improved as they had a solid, visual foundation from which to plan their work. We have seen that children specific barriers are reduced, productivity and engagement increased and time off task and adult time spent supporting reduced.

LESSONS LEARNED

Story telling is a powerful motivator but writing skills are the most difficult to achieve without careful planning and structuring the material.

This visual way of producing backgrounds introduced structure and sequence which are important elements in writing. Also, by creating the game first the story and writing come as a bonus- very much like needing to arrive at a destination and learning to bike/drive or swim if faster than walk.

There is an element of competiton as well as fun which enhances the experience and the more difficult skills is decomposed and demystified.

SWEDISH LESSON (LINDA) IN A MAINSTREAM SCHOOL (LEXBY)

In Swedish lesson in 6th grade, the students wrote fairy tales with topics of their own choosing. The students could use Scratch visualize parts of their fairy tales and make a game out of it. I expected it to deepen their memory of the fairytales they wrote about.

In the first lesson the students got the chance to test Scratch and they watch an instructional video on how to use Scratch. To get started they also create their own accounts and was told to try it out a bit just to get to know the digital tool a bit. In the first lesson the students together with the teacher comes up with different ideas for games, for example a simple maze game or a racing game.

Very soon the students were teaching themselves, and they started to work independently with big parts of the game. The students also learned from each other and were also allowed to use trial and error. The responsible teacher (Linda) was always present and Erik was also available resource throughout the process.

The students started by writing their story - there was some good and some evil characters that could be seen in the picture. When the story was written, they were commissioned to paint a background and the figures / objects they wanted to participate in their programming. Programming would be done as a game based on some part of the story to enhance the feeling / visualize how to think.

Challenges

- Teachers Skills: Learning to Use Scratch in Class Needs Planning and Time: The challenge for the teachers was that Erik needed to be involved in the start of the work. He prepared examples of games, with templates they could use.

Changes identified:

- All students were more motivated, doing work at home without it being a home work.
- They worked with more joy during the lessons.
- SEN students grew in confidence as the process went on.
- Aims were achieved with the work area. The students became involved when they were to help each other with programming. One thing that was fun to see was that students that I did not usually see that much from, shined and did something extra because this was an area which they had good knowledge of.

Student Feedback

Overall the students are very satisfied and excited about the use of games to bring their fairy tales they have written to life.

The students felt more motivated and were also encouraged to learn themselves by watching You Tube or by learning from each other.

Their own goals with their games were:

- to make the game as close to the fairy tale as possible
- to make the game work well
- to get better at programming and also learning in different ways.

Their learning was affected positively, and some of them said they learned maths in a Swedish lesson without thinking about it first.

Everyone thought it was ”Fun!”. They reaction was also: ”Oh so this can be education!? I didn´t think of it as Swedish lesson because it was so fun”.

”I have made stories before, but I don´t remember them anymore. But now I do remember the story and it is almost like I am in the story myself.”

”the teacher aimed to make the lessons more fun for the student, and it really is!”.

”To make things work. Before I start to make a game I have always an idea of how it shall work, but I always run into problems and I need to think in different ways and make a lot of changes along the way.”

” I have learned a lot! Especially what X and Y is. I have also learned that programming can be really easy if you want it to be.”

“You have to think in another way. I run into problems all the time and then I get inspiration from friends, teachers, other games, or I just have to try in different ways.”

What are the challenges?

Despite running into a lot of problems, and a constant struggle to find new ways to solve them, the students expressed joy in finding solutions, by themselves or together with classmates.

“You should do this more often!”

“Its good, more schools should be doing this”

“I would like to do this in more subjects. Imagine a game in history lesson about medieval times.”

Lessons Learned

- It would have been good to have more time to introduce Scratch.
- Trust that some students are self-learners of the digital tool
- Allow students to help the rest of the group in the beginning.
- Allow the students to use online resources to solve their problem along the way, because the teachers do not always have the answers.
- Things often don’t always work to plan!
- If the work with games and digital tools in school such as Scratch would be taken to the next level, it is imperative that the teachers learn more about the digital tool - beyond the basics. This is true for Scratch and other tools like it. This takes time and engagement, which is a crucial fact.
- Scratch is quite easy at first but students would often make their games a bit "too cool" which meant that programming became too difficult for them to master at the time they had at their disposal.
- Plan for it to take longer than you think.
- Familiarize yourself with scratch so that you can accompany the work. Do some own examples of games before starting with the class.
- Let the students work in pairs.
- It's good if they use headphones - greater focus.
- When you have worked with a group of students, they can be included as extra support next year if you do it again, as “junior advisers” peer support or something like that.

- Scratch Training: Example of training for Dig Curriculum : 4 half days once a week with time to practice in between and then have a session every 3 month (once a term) .
- Create templates for games with different challenges.

Resources

The games were uploaded to the school portal, were also the instructional movie a few links to further information about Scratch is available:

https://sites.google.com/a/utb.partille.se/lexby-games/home

Activating students as owners of their own learning, and as resources for each other – Embedded formative assessment, Dylan William 2013.

ART LESSON IN A MAINSTREAM SCHOOL (LEXBY)

In Art class the students drew background pictures for the fairytale game and also the characters in the game or other elements that might be a part of the game.

This was a fun way to work with the picture and Swedish together.

There were some good and some evil characters that could be seen in the picture. When the story was written, they were commissioned to paint a background and the figures / objects they wanted to participate in their programming. Programming would be done as a game based on some part of the story to enhance the feeling / visualize how to think.

Lessons Learned

- Digitizing their own images and editing them worked well, but instead of doing it in scratch, they perhaps could have used a better user friendly image program first, and then insert the figures into scratch.
- In addition to own pictures, you can bring your own music / audio as well.
- Have the children create their drawings for a certain date.
- Line up all the drawings so you can take a photo of them all at once.
- Upload the pictures to a folder that you share with the children, so they can access their pictures in their code.
- Practice yourself, so you have fast answers.
- Let the children teach each other.
- The children think it is fun to create their own game, so it generates motivation for school work. They can lack interest if they get stuck and no one is able to help them out.

MATHS LESSON IN A MAINSTREAM SCHOOL (LEXBY)

A class was given the aim to create a game with a maths goal : Multiplication and other basic math skills, algebra, geometry. This group was chosen where the tool would come in a relatively natural way. The selection fell on a grade 6 that would start working on another course with the theme of fairy tales (Linda's project). The students were positive to the work and developed their programming through joint reviews, but mainly by helping each other.

This would test programming skills such as programming and loop, how to build a skill, time as variable (have a limited time - eg 60 sec and GAME OVER), other variables (like in math) and how they change.

Here the understanding is deeper then when not using games

Design and output were important: to build a 'studio' of games and show to people and of course there it should look like a 'real' game.

The starting point was the tool we chose would work on chromebooks and not be difficult to administer. Scratch came into the picture early because the teacher (Erik) was familiar with the environment, knew it worked well on chromebooks and many of the students knew it.

The teacher also expected the students to help each other and by searching for answers on the internet to solve the problems.

Changes identified

- Several of the students who usually have social difficulty gained confidence as other students asked them for help, because they were good at programming.

Lessons learned

- The process was a bit too fast for some – they would have benefitted from learning more Scratch.
- Work with and learn the program you choose so that you know it well. Students solve a lot of problems themselves but it helps a lot if you as a teacher are well acquainted with the program and the knowledge base.
- Make examples that the students can follow or change a little if you can not do everything in its entirety.
- Be prepared that it takes longer than expected. Use the advantage of a peer to peer system where students who previously worked with Scratch can enter and act as teachers.
- Perhaps it would be good if all students in grade 6 during their first semester were given a course of how to use Scratch to present things. Then that could have been another tool in the toolbox for them and made projects like this easier.
- You can start at any time - you need a plan : a lot of help/structure in the beginning but later allow for variety later when students go their own direction
- limit the time tasks that are relevant and useful.
- Allow for some fun of course. Not too much structure. (This is this different for SEN.)
- Aim to make them interested in programming:
- Sen students needed more about special interests and in programming so we should harness that- it gave them confidence by helping other kids. When language is not a barrier.
- Coding should be a basic skill in ICT (maths)

Resources

ERIC's Examples of Movements (https://sites.google.com/a/utb.partille.se/lexby-games/home)

SPANISH LESSON IN A MAINSTREAM SCHOOL (LEXBY)

Students were given a series themes following the topics (eg. family, weather etc) and asked to create a game using sounds and vocabulary, which could include their voices speaking the words.

The teacher (Paola) thought that it would be an innovative way to work on consolidating knowledge. she did not know what to expect and wanted to experiment.

The themes/topics we had studied were written in chronological order on the whiteboard. The topics could be to shop in a store or to visit a family member. They could choose a topic and furthermore, they would choose how the game was designed. One purpose was that other students could play the game, and this had to be kept in mind during the work. The whole class tested and most thought it was a fun way to repeat Spanish and create new things with the help of computers.

Students worked in pairs on a project and the length of the projected lasted from 2 weeks to 10 weeks for slower programmers. Examples of games were memory cards (matching), Shopping (go to store) with dialogues between buyer and seller, the fastest pair then made the game in spanish.

The students had a good knowledge of computer technology and were able to quickly launch their imagination while learning Spanish language skills and discussing them in pairs.

When they finalised the games they made some versions in english and swedish so that they can be used in new classes to introduce spanish.

In the future I am aiming to get the instructions in spanish to see how they children pick up language skills without preparation.

Lessons learned

- Working with Eric as ICT teacher was seamless as the children were familiar and worked with him. As he did not understand the spanish I had to keep the control and guide him through the language learning.
- If you are to lead a group that does not have pre-programming skills then educators need good knowledge beforehand. Be prepared and read up on programming before you start.
- I felt that I had less knowledge of programming than the students. I therefore think that teacher training in programming is needed to be able to help and inspire students.
- It was difficult to work without support.
- I am more confident now to use it and pair up students with different abilities.
- I will match students from the years above to work with beginners both in spanish and in scratch.
- Classes of different levels will work together to mentor each other.

Resources

https://sites.google.com/a/utb.partille.se/lexby-games/home

SWEDISH LESSON (SARA) IN A MAINSTREAM SCHOOL (LEXBY)

Part of the curriculum at 6th grade is to write a fairy tale. Another part is to combine pictures and text / multimedia. This was the basis for this case study. The students were given a series of rules to write a fairy tale – have evil and good and three challenges.

Before we started the project, I had them draw a background and characters during tutor time and as homework. In that way we could focus on the actual programming.

They worked in pairs on one story they had written before as homework.

They had to draw a background, create two characters and a problem – for example a dragon appearing.

Erik had made six samples that they tried out. These samples inspired them when creating their own games. Some of them had used scratch in 5th grade, so they were familiar with the code and became the experts in the

group. I had them help each other to search for mistakes when the code didn't work or to show each other ideas on what you could do and how to execute the code.

All the artwork pictures were put in a shared folder, so the students could access them as 'Sprints'

They had 6 examples where they could check the codes of simple movements (from Eric) eg move sideways, make a bat fly across screen etc. These examples are key for teachers to use as they normally take time.

In the Swedish language and literature curriculum, it says that you should work with text and picture and how they are linked together. By using Scratch for our story, we took the writing process one dimension further. Most importantly was that they thought it was fun.

Lessons Learned

Creating example movements ready to use and that fit the purpose of the lesson is key.

TEACHER EVALUATIONS FROM WORKSHOPS:

What possibilities do you think the use of games in education opens up?

- It increases the desire to learn.
- Increased desire to learn and more creativity amongst the students.
- The right game can make education more fun.
- Games can develop communication skills and gives the possibility for quick feedback.
- Invokes interest, commitment and desire to learn.
- Huge possibilities if games are used the right way.
- The possibility to get another way to learn.
- With deepened knowledge you get the opportunity to involve several subjects in your teaching, and work cross curriculum. Cooperation, reasoning and the opportunity to train several skills at once. Children who need to be acknowledged can get this in the game, with the chance to level up and feel successful.
- Creates interest amongst the students and they don't notice that they are doing school work.
- Students who usually don't shine gets the chance to do just that.
- Motivation
- The opportunities are plenty; cooperation, communication, creativity. But we are not there yet. You have to know the different digital tools in order to dare to let the children try this in school.
- Most of all the opportunity to let the students themselves adapt the level of difficulty.
- Increased motivation and participation.
- The students can use more of their imagination.
- It gives a good opportunity to capture the students interest.
- Develops logical thinking and are a joyful complement to ordinary teaching. They can learn from each other.
- I am convinced that you can reach and inspire many more students.

What challenges do you think the use of games in education have?

- To involve learning as a part of the process.
- To make it relevant for education and not just a "fun element".

- That it is too difficult and time consuming. I am as a pedagogue not familiar enough in games for education. For example I was supposed to play Codemonkey with my students but it was not clear enough how I was supposed to get student accounts for all students and it created a barrier to big.
- To get the students to develop thoughts, ideas, knowledge and not just so that they want to progress further in the game.
- It is important to connect games to the curriculum.
- Your input as a teacher is important. Be prepared!
- To create an interest, perhaps the students don't understand that games is a way to learn.
- The biggest challenge is in the new way of thinking as a teacher. It should not be that you add another part of teaching, but that you integrate the possibility to use games such as Minecraft or other games.
- One challenge is to stay with what the task/work is supposed to be about. Short limited lessons can be a problem since many students need extra time and attention to get started and understand new things.
- To turn the experience from the game into knowledge.
- The courage to break boundaries, we need to see the future as it is and not how it used to be. The school is not always on par with what is going on outside the building. The principals must invest in quality in education for pedagogues and students.
- Functioning IT tools, charging stations and scientific proof of the use in order for it to be "accepted".
- The challenge is that more pedagogues need to dare to go outside their comfort zone and use digital tools to a greater extent. Even in areas they do not know from the beginning.
- Many children already have too many hours in front of a screen, in school and at home. You need to think about this.
- Where does the line go when it is only for play? Or maybe it is not a problem?
- To think outside the box. And technical competence.
- That you as a pedagogue dares to let go of some control and invite the students.

What did you take home with you from the workshop about Games?

- That a padlet is not the best pedagogical tool.
- Tips, ideas. Already I have an idea I have tested.
- Fun idea to connect Scratch to a fairy tale.
- Interesting with Kodu, but I would rather test Scratch.
- That I would like to take up teaching using Scratch again.
- Everyone can do this.
- Pedagogical tools. That technology doesn't always work when you want it to J
- Not much since I cannot use these products on the Apple products we have in school. But it was interesting.
- How it gives different students the opportunity to meet on a platform where they can be/become more equal.
- That there are many positive benefits from using games and especially for a certain group of students that really needs it.
- A feeling that the district West Gothenburg's investment in iPads for students is not based on experience.
- The possibility… The work with coding I did not understand much about.
- That it suites SEN-students really well.
- That you by playing can increase the students input.
- Kodu – a good alternative to Scratch.
- Fun, but a bit too childish for older students. I need to update my knowledge and learn more.
- I became more convinced that this is an inspiring way of work, for both students and teachers.

Resources / What is Needed

Motivating students to learn programming in everyday classroom contexts is a challenging task for teachers. The release of programming tools has potential to engage students in learning and to address motivational issues for mainstream students in class. A study that questioned student and teacher perceptions of learning while using a gaming environment it was observed that there was a residual of resistance to learning but that a significant percentage of students were motivated by the experience.

SCRATCH

Scratch is a free programming language which enables children and young people to program and share their interactive creations such as games, stories and animation with people from all over the world. Children learn to think creatively, work collaboratively and reason systematically.

Scratch can be used across a wide range of curriculum areas including:

- Computer Science
- Engineering
- Language Arts
- Mathematics
- Music
- Science
- Social Studies
- Technology
- Visual Arts

Children learn about the process of design, experimenting with it and debugging it. This inevitably leads to new ideas, new projects and so on.

It is a 2D environment, with sets of characters. Additional characters and environments can be added to the programme, to enhance the features, including a Lego version.

Scratch is free. You don't need a license to use Scratch in your school, home, or anywhere else. The development and maintenance of Scratch is paid for by grants and donations. Scratch is developed and maintained by the Scratch Team at the Lifelong Kindergarten group at MIT Media Lab.

There is a comprehensive guide to using Scratch on the website:
Link to Guide – Creative Computing Curriculum Guide -
http://scratched.gse.harvard.edu/guide/files/CreativeComputing20141015.pdf
There are also translations of the guide available on the site.

A paper on all elements of learning using scratch is available on:

https://scratch.mit.edu

There is a comprehensive guide to using Scratch on the website:
http://scratched.gse.harvard.edu/guide/files/CreativeComputing20141015.pdf

which includes ativities for classrooms.

Examples of BLOGS and articles around using SCRATCH in Education:

Wilhelmina Peragine - Scratch Administrator

I've worked in inclusive classrooms with several students with autism and one thing I've found helpful to keep in mind is that each student with autism is as variable as any other learner (in terms of likes, dislikes, strengths and weaknesses).

I wonder if some of the activities from the Creative Computing Curriculum Guide could be useful in this case. For example, you could sit with the student and let them click around the Scratch interface, seeing what happens as they click? Maybe you could look at a variety of projects (of their choosing) together and let them point out something they would like to be able to create or remix? For many students with autism, abundant choice and lack of structure is overwhelming, so perhaps an activity with constraints - like Ten Blocks (also from the CC guide) - would be a helpful place to start?

A few other resources I found that might be helpful:

Here is a brief discussion of the ways in which the Scratch online community can be helpful for some students with autism.

Here is a ScratchEd Discussion about working with students with disabilities.

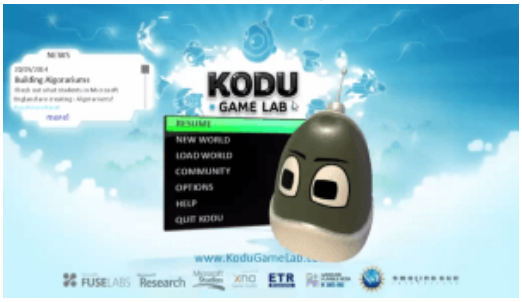
Here is an article about programming and students with autism.

Here is a list of tips for teachers working with students on the autism spectrum.

Article on Creative Learning Approaches – https://www.edutopia.org

KODU

Kodu (https://www.kodugamelab.com/)



Kodu is a free visual programming language designed specifically for creating games. It is designed to be accessible to children and can be run on both PC and Xbox (there is a small charge for the Xbox version). Kodu can be used to teach creativity, problem solving, storytelling, as well as programming and both children and adults need no design or programming skills.

Additional options for Education

(https://www.kodugamelab.com/discussion/kodu-community/news-and-features/2012/7/kodu-mars-edition/)
Kodu & NASA: Mission To Mars
Designed to engage students through game development, Kodu: Mars Edition shows what it is like to explore the surface of Mars, how to program an autonomous vehicle to scan and inspect unique features in the terrain, and allows students to recreate and simulate their experiences after researching a Mars landscape.
Kodu Classroom Kit for Educators
The Kodu classroom kit is a set of lesson plans and activities for educators, after-school instructors, parents, peer mentors and administrators. The entire kit is available as a single zip file for download or as single lesson plans

There is a comprehensive compilation of resources including training videos, sample lessons, starter worlds, and connections to other Kodu educators on:

https://www.kodugamelab.com/resources/

Blogs and Learning Resources

Kinect in Education: How to Create Relevant Games - http://www.kinecteducation.com/blog/tag/kodu-in-education/

Kodu Game Lab Review for Teachers | Common Sense Education

https://www.commonsense.org/education/game/kodu-game-lab

Artlcle by Ollie Bray in Teach Primary - ICT: programming with Scratch and Kodu

http://www.teachprimary.com/learning_resources/view/ict-programming-with-scratch-and-kodu

example lesson plans and educational content designed for Kodu, specifically available free online

http://educade.org/teaching_tools/kodu

MINECRAFT FOR EDUCATION (HTTPS://EDUCATION.MINECRAFT.NET/)

Minecraft: Education Edition is a version of the popular open world game, Minecraft, specifically designed for education. It contains features that make Minecraft more accessible and effective in a classroom setting including:

Classroom Mode is a companion app for Minecraft: Education Edition that shows a high-level map view of the world, a list of all the students, the ability for a teacher to teleport students, and a chat window to communicate. Classroom Mode is provided for Educators who may want to observe student activity without being in the game.o Classroom Mode is a companion app for Minecraft: Education Edition that shows a high-level map view of the world, a list of all the students, the ability for a teacher to teleport students, and a chat window to communicate. Classroom Mode is provided for Educators who may want to observe student activity without being in the game.
Camera + Portfolio: An important aspect of teaching with Minecraft is being able to collect evidence of learning in the game, and being able to track student progression. The camera and portfolio features allows students to take screenshots of their work and document the development of their projects.

MICROBIT (WWW.MICROBIT.ORG)

The Micro Bit itself is a circuit board measuring just 50x40mm with two buttons and an array of 25 red LEDs in a 5x5 arrangement. Kids can program the board via a web-based interface to do many things, including flashing up numbers, letters and scrolling messages on the LEDs. Plus, since there's a built-in accelerometer and compass, it can detect movement and tell which way it's pointing. The buttons can control games, or even control music playback on another device such as a phone. It can do this because it has on-board Bluetooth, so it can communicate with other Bluetooth devices including tablets, cameras and the increasing number of smart home gadgets. There are also five rings which work with crocodile clips or 4mm banana plugs. Using these, kids can attach more sensors including thermometers, moisture sensors, proximity sensors and more.

Kids will be able to program the Micro Bit via a web-based editing environment. There is a choice of editors with block programming languages as well as JavaScript, Python, and C++.

You can choose your preferred language and once a program is finished it can be saved and sent to a server which compiles the program into the code the Micro Bit can understand. The compiled program can then be downloaded and transferred onto the Micro Bit.

LEGO

https://www.lego.com/en-gb/aboutus/lego-group

LEGO is a construction toy consisting of interlocking plastic building blocks and is one of the most popular, and best-selling, toys of all time and is a household name all over the world. It's fun for children and adults of all ages.

OTHER RESOURCES

General Software, hardware and programming tools

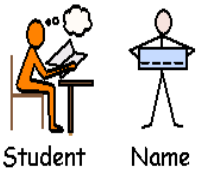
- App Inventor (Year 6 Programming) http://appinventor.mit.edu/
- Scratch (Programming for primary) http://scratch.mit.edu/
- Blockly https://code.google.com/p/blockly/
- TouchDevelop (programming) https://www.touchdevelop.com/
- Beebot Software http://www.focuseducational.com/category/item/6
- Lightbot http://light-bot.com/
- BigTrak http://www.bigtrakxtr.co.uk/
- Just2Easy including J2Code http://www.j2e.com/j2code/

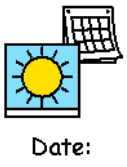
iPad apps

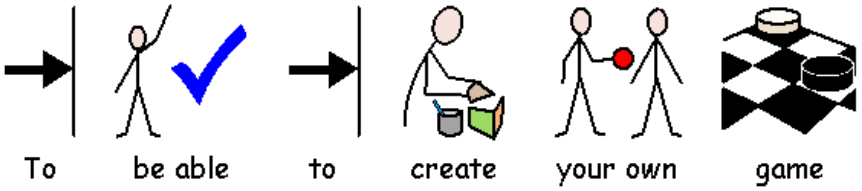
- ScratchJr http://www.scratchjr.org/
- Kodable http://www.kodable.com/
- Hopscotch https://www.gethopscotch.com/
- Beebot https://itunes.apple.com/gb/app/bee-bot/id500131639
- Daisy the Dinosaur http://www.daisythedinosaur.com/

SEN WORKBOOK

CREATING YOUR OWN GAME



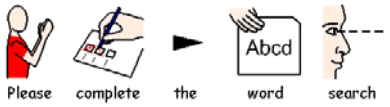




Success Criteria:

- Be able to design and plan a game ☹ 😐 ☺
- Choose an appropriate piece of software ☹ 😐 ☺
- Create your game on your chosen software ☹ 😐 ☺
- Be able to evaluate why you chose a specific piece of software ☹ 😐 ☺
- State the tools and features you have used ☹ 😐 ☺
- Be able to provide the code you have used to make your game successful. ☹ 😐 ☺

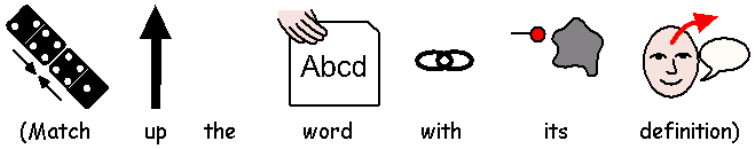
Task 1



E	F	C	Q	I	C	D	Z	V	A	N	F
I	O	I	W	F	G	Y	B	E	O	V	N
G	U	F	L	J	A	R	A	C	K	E	T
R	I	O	D	Y	L	M	D	F	F	S	U
X	D	U	V	R	Z	T	L	U	S	A	C
A	Y	S	C	M	V	P	U	R	C	D	O
H	I	I	K	O	D	U	C	J	R	O	M
V	A	R	I	A	B	L	E	S	A	S	M
P	U	S	E	N	S	I	N	G	T	T	A
W	H	E	N	Y	D	C	C	A	C	O	N
G	C	O	N	T	R	O	L	S	H	R	D
C	H	A	R	C	T	E	R	O	F	Y	S
U	J	R	E	W	W	A	E	G	A	M	E

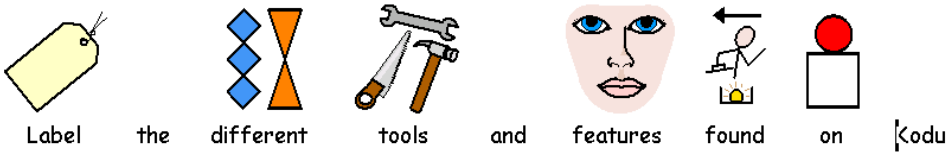
Sensing Do Scratch When Variables Controls Kodu Commands Charcter Game Story If

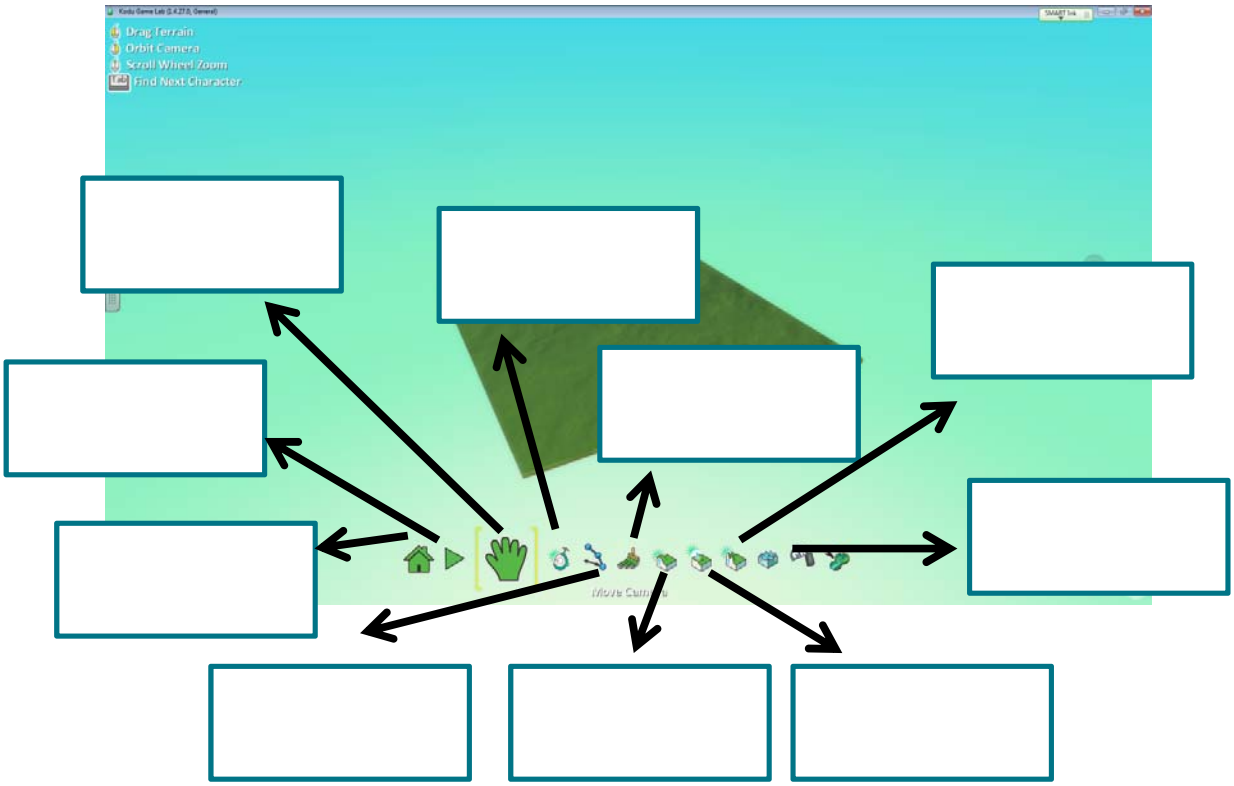
Task 2



Scratch	A data item that may take on more than one value during the runtime of a program
Variables	Is the order in which individual statements, instructions or function calls of an imperative program are executed or evaluated.
Kodu	Allows users to use event-driven programming with multiple active objects called sprites
Controls	A visual programming tool that avoids typing code by having users construct programs using visual elements via a game controller

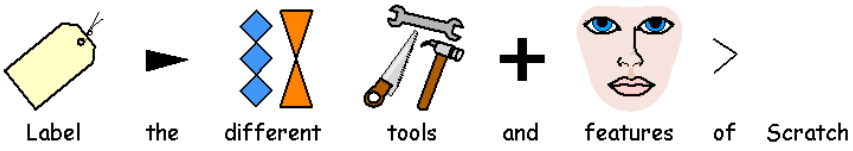
Task 4

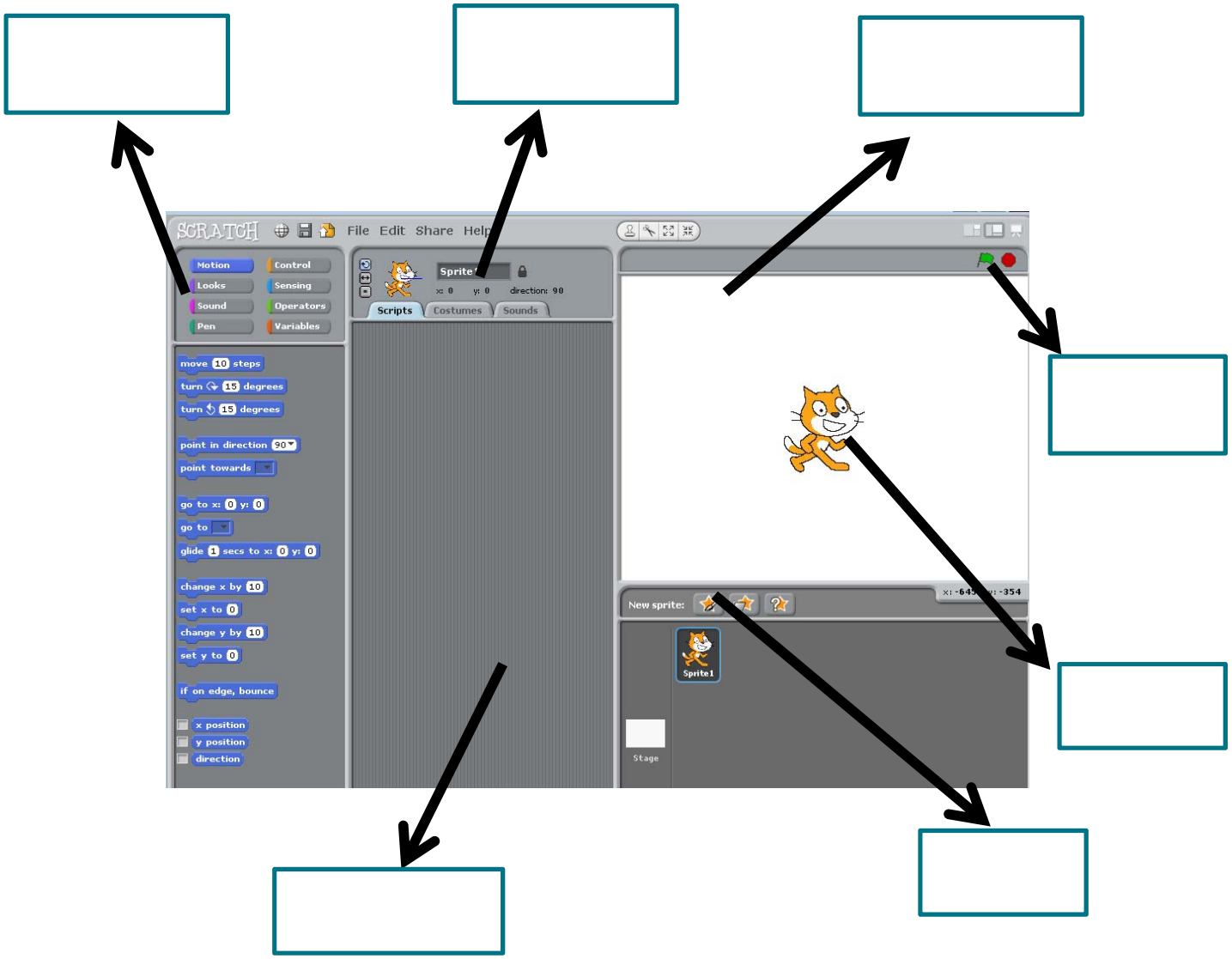




HOME, CAMERA, INSERT HILL, WATER, PLAY, PATH, INSERT A CHARACTER, TERRAIN TOOL, SMOOTH, INSERT SPIKEY HILL

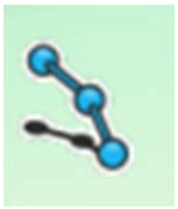
Task 5





Sprite, Coding Area, New Sprite, Run/Stop, Background, Sprite Name, Controls

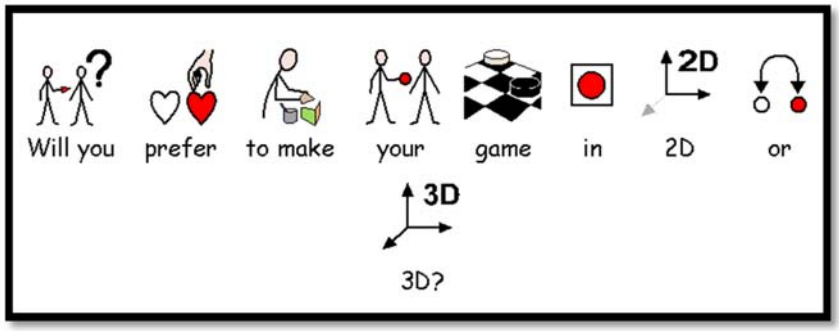
Task 6

Tool	What it does
	
	
	
	
	
	
	

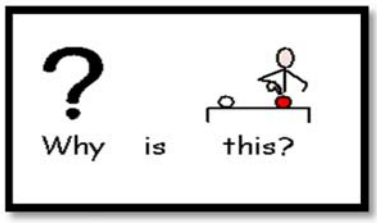
Task 7

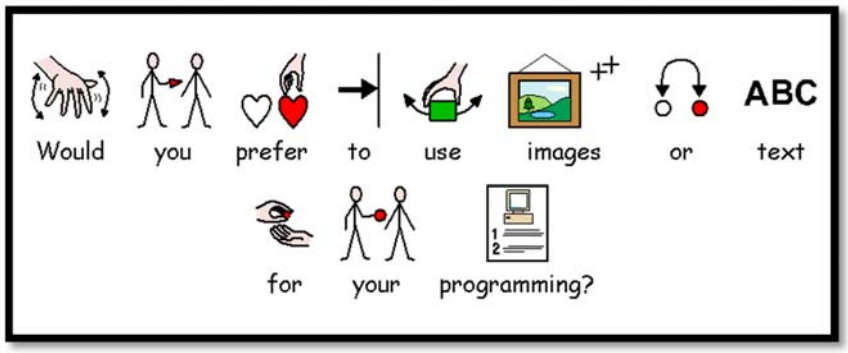
Tool	What it does
	
	
	
	
	
	

Task 8

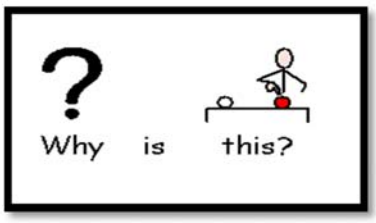


☐ 2D ☐ 3D





☐ Text ☐ Image



Task 9

You have been asked by Rock star to create a racing game for 12-16 year olds. You have been given two pieces of software to choose from;

- Kodu
- Scratch

It is up to you which one you will use. You have been taught how to use both. You will have to design the game yourself and evaluate the features of that software that made it possible.

Your game/you are being asked is to include the following;

- A one player racing game
- You must be able to race against an AI (Computer Controlled Character)
- Create the world/background
- Have a scoring system
- Have a start/end system

Task 10







Please follow the instructions below to help you design your

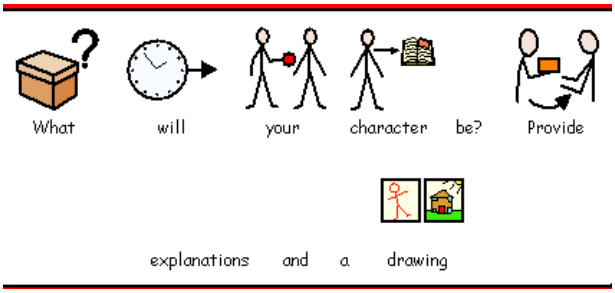
computer game


Name of Game

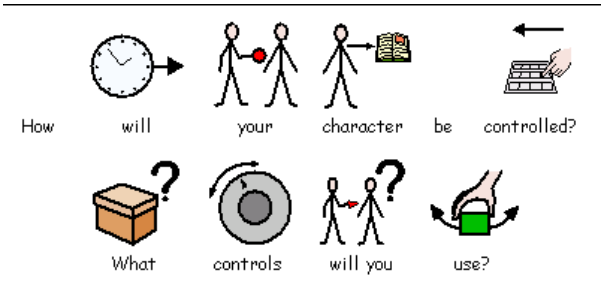


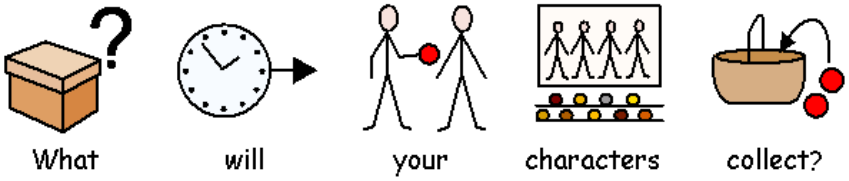
Draw your World Design:

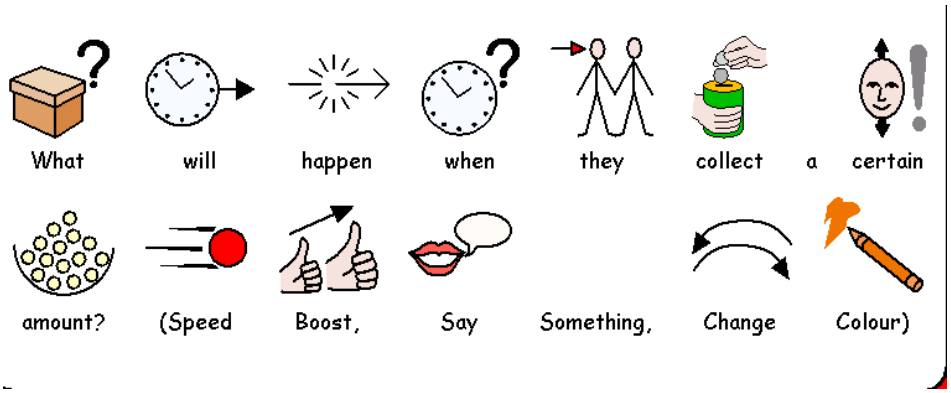
PAGE 41

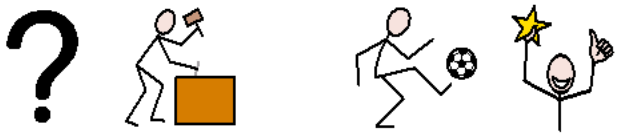


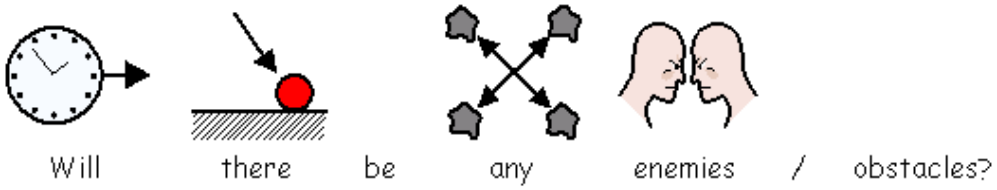
Name of Character	What will your character be?
Drawing:	

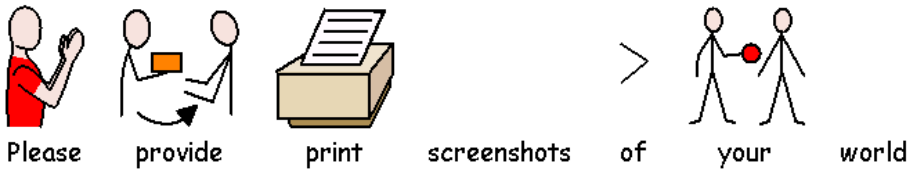



What
will
your
characters
collect?


What
will
happen
when
they
collect
a
certain
amount?
(Speed
Boost,
Say
Something,
Change
Colour)


How
does
the
player
win?

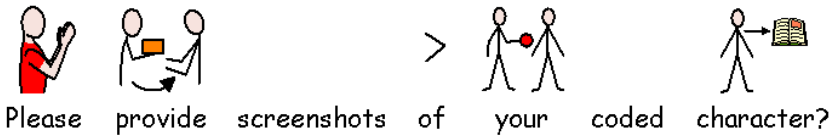

Will
there
be
any
enemies
/
obstacles?



Task 11

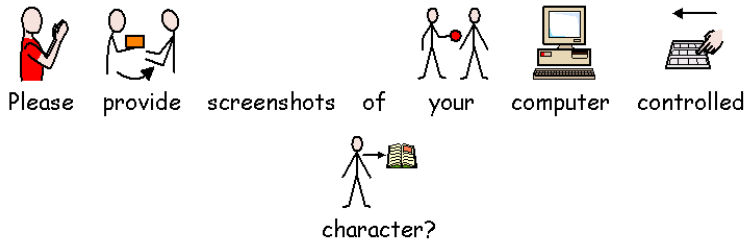
1)

2)



1)

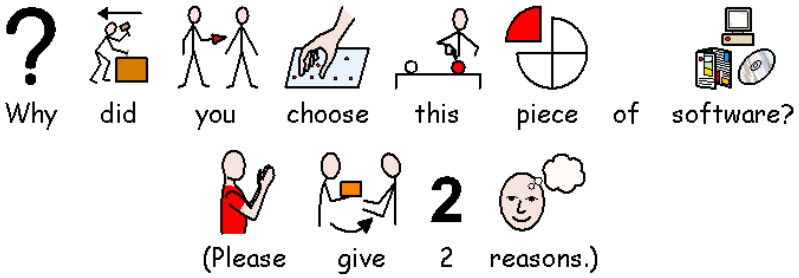
2)


Please provide screenshots of your computer controlled character?

1)

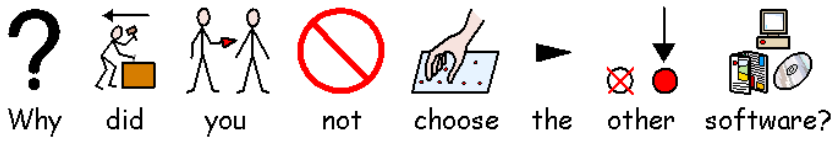
2)


Which piece of software did you use?


Why did you choose this piece of software?
(Please give 2 reasons.)

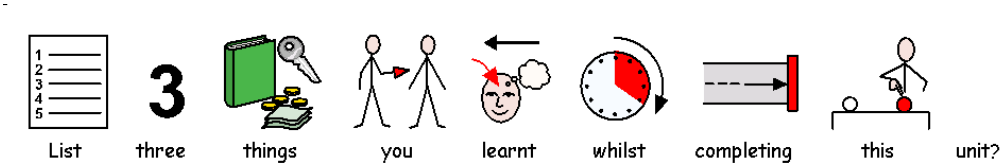
1)

2)



1)

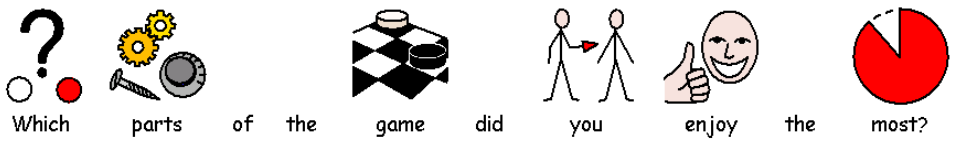
2)


List
three
things
you
learnt
whilst
completing
this
unit?

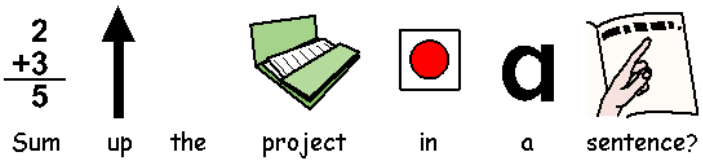
1.

2.

3.


Which
parts
of
the
game
did
you
enjoy
the
most?


What
would
you
do
better
next
time
and
why?


2
+3
5
Sum
up
the
project
in
a
sentence?

REFERENCES

AICTEC. (2008). Teaching for the Digital Age Work Plan 2009-2012. http://www.aictec.edu.au/aictec/webdav/site/standardssite/shared/TDA%20workplan.pdf

Bavelier, D, C.S. Green, and M.S. Seidenberg (2013) .Cognitive Development: Gaming Your Way Out of Dyslexia? *Current Biology Vol 23 No 7 R282*

BECTA. (2010). *21st century teacher: Are you ready to meet the challenge?* Coventry: BECTA.

BETT Presentation (ADD LINK or PP)

Blikstein, Paulo; Krannich, Dennis (2013). "The makers' movement and FabLabs in education: experiences, technologies, and research". Proceedings of the 12th international conference on interaction design and children: 613–616.

Churchill, D., Fox, B.and King (2012).'Study of Affordances of iPads and Teachers' Private

Theories' .*International Journal of International of Information and EducationTechnology, 2(3)*

http://www.ijiet.org/papers/122-K10017.pdf

Ditzler, C., Hong, E., & Strudler, N. (2016). How Tablets Are Utilized in the Classroom. *Journal of Research on Technology in Education*, *48*(3), 181–193. https://doi.org/10.1080/15391523.2016.1172444

Donaldson, J. A. (2015). Walling, D. R.: Designing Learning for Tablet Classrooms: Innovations in Instruction. *Technology, Knowledge and Learning*, *20*(3), 361–363. https://doi.org/10.1007/s10758-015-9252-x

Dougherty, Dale (2013). Design, make, play: Growing the next generation of STEM innovators. ISBN 978-0415539203

Flewitt, R., Messer, D., & Kucirkova, N. (2014). New directions for early literacy in a digital age: The iPad. *Journal of Early Childhood Literacy*, 1468798414533560. https://doi.org/10.1177/1468798414533560

Florian, L. (2004). Uses of technology that support pupils with special educational needs. In L. Florian & J. Hegarty (Eds.), *ICT and Special Educational Needs: A tool for inclusion* (pp. 7–20). England: Open University Press.

Kress and Pachler (2007)

Loveless, A. (2011). Technology, pedagogy and education: reflections on the accomplishment of what teachers know, do and believe in a digital age. *Technology, Pedagogy and Education*, *20*(3), 301–316

https://doi.org/10.1080/1475939X.2011.610931

Ren, Y. (2014). Information and Communication Technologies in Education. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of Research on Educational Communications and Technology* (4th ed., pp. vii–xii). New York: Springer.

Swedish National Agency for Education, Swedish curriculum for the compulsory school, preschool class and the leisure time centre (2011), p. 22-23.

Thomas, S., Schott, G. and Kambouri, M. (2003) in J. Attewell, Mobile technologies for learning, London, UK: Learning and Skills Development Agency, 2005.

Recommendations and How to Move Forward

Thinking of the game as a part of a bigger educational process is really in the core mind-set that this project wants to promote. Games can do many things very well, but they certainly cannot do everything at once. Especially not without solid supporting structures around them. Throughout the project and the case studies we built this was true. As each teacher build her or his story these processes were discussed and reflected upon and we will be referring to these and link back to them.

This project aimed as much at using alternative and innovative methods to teach through coding digital games and playing games as part of learning, as at developing the skills of teachers in extending academic goals to understand, support and include the whole child: not only their academic subject skills but also social, emotional and behavioural skills.

Some key factors have been identified which have enabled the teachers at the schools we saw to take steps towards better embedding games into their lessons. Many of these factors have been highlighted as the factors needed to bring about teacher change.

- Senior management leaders team provided teachers with time to learn to use and play with technologies: this is helping to improve teachers' self-efficacy and confidence.
- Giving support to guide the use of technology and help build confidence.
- Giving teachers freedom and trust thus enabling teachers to take risks and experiment with ICT.
- Encouraging teachers to meet and support one another through sharing ideas and knowledge.
- Providing technical support.
- Recognising and valuing teachers as professionals by giving more responsibility to enable CPD and career progression.
- Creating a culture of shared responsibility at all levels of the school, including the Headteacher, class teachers and support staff.
- Making funds available to purchase ICT.
- Encouraging teachers to use online spaces (Blogs, School websites) to share ideas and scale up.

The examples in our project support these important points.

SUMMARY POINTS

RISK AND SUPPORT: Games, as other ICT tools, should be used when the learning of the content is supported, when teachers feel at ease using them and are confident, ready to risk having a few 'failed' sessions till they get it right.

EMBED AND PLAN: Game choice should involve careful consideration of related theoretical context relevant to curriculum and learning outcomes. There should be clear tangible learning objectives with tasks suitable in supporting students in developing specific skills and knowledge.

NURTURE and TRUST: These innovative pedagogies should be part of the school plan for developing teachers' skills and make happier students.

THE ROLE OF THE TEACHER

When attempting to incorporate games in current teaching practice, we considered the question: **what roles should teachers take on?**

We agree and found similar results with two studies carried out using the game MinecraftEdu in Swedish schools which showed different roles that the teachers play throughout the process of using the games in the classroom (Marklund & Taylor 2016). They found that teacher would serve as

- ***Gaming anchor*** aiming to support students' digital play experiences; here teacher– developer 'skills may be needed.
- ***Authority and enforcer,*** in charge of redirecting students who become distracted back to educational- focus play; and
- ***Subject matter anchor,*** trying to maintain the established subject matter.
- But the most important role is that of
- ***Facilitator***: tackling all the problems and helping students complete game playing as well as routine learning. In the process of facilitating, various techniques would be adopted by different teachers including giving examples, providing scaffolding and raising questions and for children with SEN 'prompting' which is explained below.

BASIC PRINCIPLES

An educational process can be thought as encouraging our students to discover, research, experiment, analyse, and reflect**.**

In some cases we need to try harder to engage and motivate students. Games can help increase both and provide sustained attention to task.(Huda's class)

The idea is to start mapping out the parts of the process in which a game could play an important role for a whole class or for particular learners :

A game can introduce a concept and help the students discover something interesting they want to know more about. It can be a venue for finding out more about a certain phenomenon, a principle, an event, or a person (Eric's class and Paul's class).

It can be a platform for experimentation and interaction with something they couldn't normally interact with (Jon's class, Paola's class).

"I thought that it would be an innovative way to work on consolidating knowledge. I did not know what to expect and I wanted to experiment. I was curious about how the students would react. It turned out that the students had a good knowledge of computer technology and were able to quickly launch their imagination while learning Spanish language skills and discussing them in pairs. Positively surprised. (Paola's class)

So we need to select a game based on the child's needs and in many cases the curriculum constraints **(**Tom's class).

Backed by research evidence, there are some lessons we drew from our project to be found.

TIE THE GAME ACTIVITY TO THE PHYSICAL AND SOCIAL SPACE OF THE CLASSROOM

Just like you would when you read a book, watch a movie or a play, or have a field trip with your students – you always want to encourage them to discuss and deliberate on the experience and its meaning both before and afterwards.(for example Jon's class)

Games are not magical environments where students learn automatically, they learn once they start to actively reflect on what they are experiencing or have experienced.

For this they need some structure, like a map or template to follow and guidance throughout. (Eric's and Linda's classes) (Huda's class)

Some will surprise you (and themselves) with how fast they move along coding and putting the elements or blocks together. They will tell you they learned things you didn't expect: unintended learning outcomes are some of the great benefits from using game-based learning. (Tom's class)

Use special interests, to engage the pupil and increase their attention span for example in Paul's class the movie 'Edward Scissorhands', a favourite of the pupil.

SELECT A GAME

How to select a game can be tantamount to : what do the students need ? How will they benefit from it?

For example (Tom's class) they may find words too difficult so imagery is the element to look for in the game and in this case it was Kodu instead of Scratch:

"More pupils will choose Kodu – More pupils will choose Kodu over Scratch and I feel this is because Kodu is a visual based platform that allows pupils with lower reading ages and literacy issues to easily design and create their own game. There is no complex language used and all choices are clear, bright and easy to read. I also believe that more pupils will choose Kodu as it is 3D"

The matter of "what the game needs to represent" is also very important to figure out, and comes down to teaching methods used. (Jon's class)

The game does not necessarily have to contain all the details of the subject; for instance you could make sure that the core of the subject is introduced in other classroom activities and then use the game as an environment where students put their knowledge to the test in interesting ways. (Eric's class)

But it can also work the other way around – the game can introduce the details of a subject and allow students to experiment and interact with it, which can be followed up with discussions and presentations in the classroom where students get a chance to reflect on what they experienced in the game or by designing it (Jon's class and Ros's class).

"*Wide variety of games* – Pupils will be a creating a wide variety of games and stories. Pupils will be given the option of creating their own world, characters, terrain, enemies and objects through the aid of their school project booklets". (Tom's reflective Blog)

In the UK coding is already part of the mathematics curriculum as well as ICT skills and in Sweden form Autumn 2018 programming will be incorporated into the revised curriculum, making this project a front runner in how to prepare for it.

WE ASSUME THE TEACHER IS GOING INTO GAMES WITHOUT ANY CONNECTIONS TO DEVELOPERS

This places more responsibilities on the teacher as an educator. It requires more time playing and planning with games, trying them out and identifying their relevant parts to the subject – in a sense you need to start thinking like a developer and create a good educational tool out of a bigger and bulkier game.

If you are to lead a group that does not have pre-programming skills then you need good knowledge beforehand. Be prepared and read up on programming before you start.

Since there's a limit to how significantly you can change the game itself without its developer to help you, you will need to modify the educational processes around the game. This is a challenge of course but a good one in the sense of re-thinking what is important about learning a concept or subject but also what is the best way to introduce it since you will need to break it down in small parts. (Tom's class)

Most games are not designed to teach a very specific thing and can have a lot of content that is superfluous to what you want to achieve in the classroom.

In fact it is the opposite: you will need to find a solution that fits the learner: In case of an autistic girl, her teacher managed to create an authentic scenario of designing a game for a client which motivated her as it was a real life situation and she could relate to it. (Paul's class).

In general, games want to entertain and engage their players for long periods of time, but as a teacher you're working with very strict time limitations and thus need to focus on the parts of a game that are relevant to your lesson plan:

Scratch has small parts that can be used as blocks and templates are used to help teachers new to it (Eric's class, Sara's class)

Minecraft is also a very good example of this because it's a very big game that many educators have put to good use by focusing on smaller segments of it.

Minecraft is the type of game you can spend a lot of time in since it's very rich and varied in its content. As Tom has shown us, you can build and decorate a home, build castles, battle monsters and more. (Tom's class)

GET TO KNOW THE TOOL : ALLOW TIME

The teacher's experience and expertise is particularly crucial.

This is where collaboration between teachers (mentoring) is needed. (See for example how Eric mentored the other 3 teachers: Eric's class, Linda's class, Paola's class and Sara's class)

The teacher needs to understand the game in order to share and plan what students are doing within it, and be able to translate game progress to curriculum progress and learning goals.(Ros'class and Huda's class)

The teacher also needs to be skilled at setting up gameplay sessions in a limited amount of preparation time.(Tom's class)

Teachers also serve the important role of anchoring the game sessions as learning activities, so they need to know how to contextualize the game content in the subject matter being taught (or vice versa). (see examples of Jon's class)

The process of a game being designed and then played can also be used to evaluate student progress through the curriculum. For example, if you notice a student has become very knowledgeable of something inside the game or is using new ways to problem solve, you need to be able to "translate" that knowledge to progress in the curriculum. By using an existing game as a sandbox to work on and 'correct' the girls were more confident in tackling their own new games but also accepted criticism more easily. (Ros' class)

MAKE SURE TO GET TECHNICAL SUPPORT

There is no doubt you will need technicians or the ICT teacher or a colleague whose skills are sharper to help you with this. Basic practical necessities like the availability of computers and tablets for preparing and conducting game sessions can be difficult to maintain, but teachers need to be able to trust that the necessary technology is reliable and available and to make checklists of equipment, licences and software you will need. This is where the school needs to support teachers and they need to form teams.

EMBED GAMES INTO THE CURRICULUM

Include debriefing and feedback so learners understand what happened in the game and how these events support the instructional objectives.

The best learning outcomes from using a game in the classroom occur when a three-step process is followed.

- INTRODUCE the game and the learning objectives covered in the game
- PLAY the game.
- DEBRIEF on what was learned after the game is played

This process ensures that learning occurs from playing the game (Tom's class).

Storytelling strategies were used (Jon's class, Linda's class and Sara's class) which helped :

Increase

- in overall engagement in writing
- in time spent on task
- in the volume of work produced

Reduce

- the time it took to settle down to the writing task
- the support required to help children form their work

The results in terms of 'subject learning' were impressive:

Games Improved children's ability to link, chronologically, as series of events and ideas and enhanced the levels of description and atmosphere in children's writing (Jon's class).

INSTIGATE COLLABORATION

This has been the most common strategy and it is backed by a lot of research.

Ask the children to pair up and collaboratively work on the task (Tom's class, Ros's class, Sara's class, Paola's class, Linda's class). Most teachers use group work to solve issues such as differentiation and mixed ability classes. (Huda's class).

Even those who thought they preferred doing it alone and faster have gained by sharing their expertise with others as this example shows in a girl's school

The teacher took the risk and was rewarded with the surprising reaction of these girls who 'would not normally admit to enjoying their work nor doing extra work at home'. By making the game a 'cool' thing to do, she not

only increased their motivation but also vocabulary. Moreover the girl's became interested in each other's projects and began to collaborate.

It is a good idea to prepare a template of a game for those who are beginners or who seem not interested in continuing with the task so as to bring them to a more interesting step forward (Ros' class).

ALLOW FOR PERSONALISATION

Particularly for inclusion in the classroom of children with special needs and disabilities, we found the using games provides a safe environment from which to operate.

See Jon's class @ World War 2 Trenches and Eric's class.

Outcomes in Huda's Class:

- increased language
- increased self esteem
- tolerating of peers
- emerging compromise skills
- turn taking
- more positive language used in groups

A teacher was able to link up his work with other teachers and as a team they could find a common thread linking the student's learning outcomes into a cohesive learning path personalised and spanning several subjects. (Paul's class)

Not all pupils are equally ready to accept new projects/criticism etc but most are interested in peers' work. Allow for diversity through making each level a separate goal so it feels achievable.

Evaluation skills are higher order and therefore we would expect them to be the most difficult to achieve.(Ros' class)

GAMES MUST INCLUDE INSTRUCTIONAL SUPPORT

Such as : elaborative feedback, pedagogical agents, and multi-modal information presentation. All classes included these and teachers commented on their use.

'There is an element of competition as well as fun which enhances the experience and the more difficult skills is decomposed and demystified.'(Jon's class)

In games without instructional support, participants will tend to learn how to play the game rather than learn domain-specific knowledge embedded in the game or indeed the processes and skills learned along the way. This takes careful planning. (e.g. Tom's class, Linda's class, Sara's class, Paola's class).

Instructional support to help learners understand how to use the game, and its features, increases the effectiveness of the designing and gaming experience by allowing them to focus on the instructional information rather than only the requirements of the game. (Ros' class) and in a different way Huda's LEGO class.

ENSURE GAME OBJECTIVES ALIGN WITH CURRICULUM OBJECTIVES

Learning outcomes achieved through computer games depend largely on how we align learning (such as learning subject areas and learning purposes), learner characteristics, and game-based pedagogy with the design of a game. In other words, if the game objectives match the curriculum objectives, disconnects are avoided between the game design and curricular goals. (Tom's class)

Equally the curriculum is continuously extended and updated to include 21st century skills and games fit right into that extension.

Story telling, for instance, is a powerful motivator and when used to design with Kodu and tell the story through PP presentation a number of these skills are involved. Of course writing skills are the most difficult to achieve without careful planning and structuring the material. Using Kodu in this visual way of producing backgrounds introduced structure and sequence which are important elements in writing. Also, by creating the game first the story and writing come as a bonus. (Jon's class)

Storytelling using Scratch combines Swedish with art in LEXBY school:

"I thought it was a fun way to work with the picture (art) and Swedish together. I expected that it would take some time for the students to take care of it, but that they would think it was fun. I expected it to deepen their memory of their fairytales they wrote" (Linda's class)

"In the Swedish language and literature curriculum, it says that you should work with text and picture and how they are linked together. By using Scratch for our story, we took the writing process one dimension further. Most importantly they thought it was fun." (Sara's class)

The more closely aligned curriculum goals and game goals, the more the learning outcomes of the game will match the desired learning outcomes of the student. This is quite hard to achieve and the topic of debate in both countries.

ETHOS OF THE SCHOOL

One of the questions we aimed at answering during the project was :

What are the factors that underline a successful model for adopting digital games in mainstream and SEN classes?

Through our visits in both countries we concluded that the school ethos needs to be one of trust and freedom that encourages teachers to be reflective practitioners as well as researchers in their classrooms. After careful planning of the lessons and allowing for time to play they gained insights into what the children could do.

From Tom's reflective blog:

"Teamwork : I believe that our school core value will definitely shine through during this project. Pupils who are able to access the work and find it easier than others will feel good helping others, who may be struggling accessing the work."

And it did. The results in those classes were particularly significant given the level of students and their difficulties in assimilating academic work as well as simply attending to a task long enough to produce an outcome.

Stepping back and observing children play and collaborate with each other was one of the ways they achieved that. They allowed for surprises.

Through trust and freedom, and time for reflection teachers are more willing to experiment with innovative ICTs and take risks without the fear of an expected outcome from senior management teams.

The school leaders in the participating schools had achieved this through building trusting relationships among staff and between staff and leadership teams and giving them time to experiment with technology.

There was a shared vision and understanding amongst the staff and school leaders about the importance of ICT and games and how they fitted in the curriculum. (Stony Dean school).

The process of experimenting over time and working with their peers led to increase in confidence amongst teachers not only in their own skills but ultimately to improve their self-belief to use games to bring about positive learning outcomes. (Lexby school).

This mind-set amongst the teachers was what prompted them and their schools to be part of the project, to be given the chance to take risks, to learn from one another and to innovate.

STRATEGIES AND SEN

Specifically for autistic children, "prompting" is widely used as a term to describe auxiliary or artificial stimuli used to increase the likelihood children will respond adequately.

Prompts or prompting procedures could be classified into different categories by different standards. According to MacDuff et al. (1993), commonly used prompts include:

- Verbal prompts, such as words, questions and verbal demonstrations used to help learners engage;
- Modeling prompts, showing an example or demonstrating the appropriate response;
- Gesture prompts, such as pointing, nodding towards somewhere to indicate some information;
- Manual prompts, including physical contact to direct learners to display certain behaviours.

Some other prompts like visual or photographic prompts, textual prompts are also being widely used. Prompts are often combined for best results.

What is more, in order to effectively use prompts, besides selecting appropriate prompts, it is also very important to "remove" prompts so that eventually children with difficulties could independently compete the tasks (see *Tom's class* and *Huda's class*).

There are some prompt-fading strategies:

a) Increasing Assistance, or Least-to-Most Prompts

The instructor offers prompts following progressive order, i.e. starts from minimal assistance and gradually increases assistance if the prompts do not work, until learners respond correctly.

b) Decreasing Assistance, or Most-to-Least Prompts The instructor provides prompts following descending order, i.e. the learners would receive whatsoever assistance needed to complete the task at the outset, then assistance is reduced gradually as long as it could help learners finish the task, until no prompts.
c) Delayed Prompts would be provided some time later after the naturally occurring task has taken place;
d) Graduated Guidance

Manual prompts provided would be changing in intensity or location, from hand- over-hand instruction to less forceful direction.

All in all, selecting the right prompts and prompt-fading strategies would effectively lead to the learner's independent appropriate response. Even if these suggestions are created for SEN they could be used with every student.