PARTICIPATORY DESIGN WITH CHILDREN AND YOUNG PEOPLE: AN ANNOTATED BIBLIOGRAPHY

Compiled by Richard Langridge, Shamus P. Smith, Kathleen Smithers and Erica Southgate

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ABSTRACT

Participatory Design (PD) has risen to prominence in many fields since the 1970's when it originated from Scandinavia. The approach brings the end user and other stake-holders into positions where they can partake in decision making and include themselves in over-all design of the end product. While PD has seen usage in areas such as rural communities and psychology, this annotated bibliography focuses on its utilization with children and young people when developing or designing digital products.

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1 PURPOSE AND SCOPE OF REPORT

Background

Participatory Design (PD) has risen to prominence since the 1970s. PD is used to engage end users with new technologies and allow them to participate in design decisions. From there, PD has expanded into the design methodology of various fields such as psychology, music, social skills and software (Løventoft et al, 2012; Nouwen et al, 2016; Tan, 2013). Literature in the field of PD with children can provide important insights into their role in the process, developmentally appropriate practice, and enablers and barriers to success.

Purpose

An annotated bibliography is a document that provides an overview of the available research on a given topic. This annotated bibliography is a compilation of abstracts from peer-reviewed research on participatory design with children and young people, published primarily during the period 2006-2017.

Method

To identify the peer-reviewed articles and conference papers, a Boolean search (and/or) was conducted using the terms: participatory design; co-design; user-centered design; UX; UXD; HCI; computers; digital; virtual reality; serious games; education; children; teenagers; and adolescents. The following databases were queried: Science Direct, ACM Digital Library, Web of Science and Scorpus. Papers were also found by utilising the conference website for participatory design (http://pdcproceedings.org/ - Last Accessed: 8:43 AM 20/09/2017). The search was restricted to peer reviewed literature published within the period 2006 – 2017.

References

Ioannidi, D., Zidianakis, E., Antona, M., & Stephanidis, C. (2017). Designing Games for Children with developmental disabilities in Ambient Intelligence Environments. *International Journal of Child-Computer Interaction*, 11, 40-49.

Løventoft, P. K., Nørregaard, L. B., & Frøkjær, E. (2012, August). Designing daybuilder: an experimental app to support people with depression. In *Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases-Volume 2* (pp. 1 – 4). ACM.

Nouwen, M., Schepers, S., Mouws, K., Slegers, K., Kosten, N., & Duysburgh, P. (2016). Designing an educational music game: What if children were calling the tune? *International Journal of Child-Computer Interaction*, 9, 20-32.

Tan, J. L., Goh, D. H. L., Ang, R. P., & Huan, V. S. (2013). Participatory evaluation of an educational game for social skills acquisition. *Computers & Education*, 64, 70-80.

2 ANNOTATED BIBLIOGRAPHY

Abdul Razak F.H., Salleh K., Azmi N.H. (2013) Children's Technology: How Do Children Want It? In Zaman H.B., Robinson P., Olivier P., Shih T.K., Velastin S. (eds) ***Advances in Visual Informatics. IVIC 2013. Lecture Notes in Computer Science*****, 8237, 275 - 284. Springer, Cham. DOI: 10.1007/978-3-319-02958-0_26**

Keywords: child computer interaction; childcentred; children; children technology; drawing; participatory design

Though today's children have many chances to interact with IT technology, what they understand about technology from their point of view still needs to be explored. In this paper, we report how children view technology according to their perspectives. We used qualitative research methods that employed drawing activity and interviews. Seventeen 11-12 years old primary school children participated in the study and produced five drawings. From the study we found that the children actually wanted technology which is ubiquitous, wearable, natural in interaction and child-centred. (Abstract)

Ahn, J. and Yip, J. and Gubbels, M. (2013). SINQ: Designing social media to foster everyday scientific inquiry for children. In ***Proceedings of the 12th International Conference on Interaction Design and Children (IDC '13)*****. ACM, New York, NY, USA, (pp. 503-506). DOI: 10.1145/2485760.2485851**

Keywords: children; cooperative Inquiry; participatory design; science learning; social media

In this paper, we describe a mobile, social media app called SINQ that was the product of a 15-month co-design process with a child design team. The goal of SINQ is to utilize social media design features in ways that help children conceptualize Scientific INQuiry practices through intuitive sharing of media and ideas from their everyday lives. We describe how SINQ builds from prior work in software for science learning and mobile technology for children. We also highlight how SINQ is a distinct evolution of technology for scientific inquiry learning. We argue that by taking seriously, the affordances of social media applications, new opportunities and design challenges arise for interaction design for learning technologies. (Abstract)

Alper, M. and Hourcade, J. P. and Gilutz, S. (2012). Interactive technologies for children with special needs. In ***Proceedings of the 11th International Conference on Interaction Design and Children (IDC '12)*****. ACM, New York, NY, USA, (pp.363- 366). DOI: 10.1145/2307096.2307169.**

Keywords: children; children's HCI; disabilities; hearing impairment; participatory design; special needs; tangible computing

There is a growing trend in both the academic and private sectors of designing innovative interactive technologies for children. These technologies could be a unique platform for addressing the freedoms and rights of children with special needs. They afford new kinds of support for children with special needs' full participation, both as children and later on as adults, in the public sphere. This workshop highlighted three underexplored themes in designing interactive technologies for children with disabilities, including considerations for participatory design, interactive technologies

for children with hearing impairments, and the possibly transformative potential of tangible computing. Some of the future research opportunities and challenges in the areas of deep engagement, interdisciplinarity, individuality, and practicality are discussed. (Abstract)

Alsumait, A., & Al-Musawi, Z. S. (2013). Creative and innovative e-learning using interactive storytelling. *International Journal of Pervasive Computing and Communications,* 9(3), 209 - 226. DOI: 10.1108/IJPCC-07-2013-0016

Keywords: authoring environments; E-learning; human computer interaction; interactive storytelling; participatory design

Purpose: Interactive storytelling is a powerful tool for improving children's development of essential skills and general knowledge. As an informal learning method, interactive storytelling provides life experience and promotes the use of vocabulary and communication skills. The paper aims to discuss these issues.

Design/methodology/approach: In this paper, a storytelling tool was developed to help kindergarteners create stories. This tool included an instrument used to measure four characteristics of four- to five-year-old children: general knowledge, creativity, self-confidence and between the children and the technology to assess a child's progress. Moreover, there is a pressing need to better understand and improve upon this educational innovation. Therefore, this paper proposed the child interactive storytelling (CIS) framework.

Findings: The developed interactive storytelling tool helped instructors as well as parents to perceive the child's progress through multiple use of the tool. Experiments indicated that teachers' evaluations of their children with those measured from the developed tool were aligned which indicates that the interactive storytelling tool is valid. Moreover, the proposed CIS framework for formalizing the design of interactive storytelling tools can be used in educational interventions for children.

Originality/value: The proposed CIS framework can guide both research and practice in the design, development and evaluation of effective and useful CIS environments. (Abstract)

Antoniou, A., & Lepouras, G. (2008, February). A fast pace method for involving children in edutainment-technology design. *Advances in Computer-Human Interaction, 2008 First International Conference on* (pp. 149 – 157). IEEE. DOI: 10.1109/ACHI.2008.9

Keywords: No keywords

Aiming at edutainment technologies for museums, elements of participatory design techniques and focus groups were combined under the theoretical framework of the cycle of creative imagination in order to involve 10 year-old children in the design process of such applications. In contrast to existing practices where children are called to evaluate games designed by adults, the proposed method involves children from the initial phases of development. The main advantage of the proposed method is its short duration (1-2 school days) allowing for its wide use. The distinct steps of the method assist children in visualizing the possibilities of using new technologies in museums. The method was tested with children in a primary school. The ideas produced by the children demonstrated their ability to generate concepts and inspire the development of new gaming technologies. (Abstract)

Arnab, S., Brown, K., Clarke, S., Dunwell, I., Lim, T., Suttie, N., … de Freitas, S. (2013). The development approach of a pedagogically-driven serious game to support relationship and sex education (RSE) within a classroom setting. *Computers & Education,* 69, 15-30.

Keywords: serious games; game development; relationships and sex education; sexual coercion; intervention mapping

Didactic approaches to Relationships and Sex Education (RSE) have been shown to yield limited outcomes when compared to approaches that stimulate peer discussion and debate. Creating effective interventions, which stimulate peer involvement, remains a demanding task and finding a solution that is not only engaging but also pedagogically sound is vital. A case thus exists for exploring how game technology might facilitate more feasible solutions. This paper presents the development approach of a digital game: PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships), designed by a cross-disciplinary team of UK researchers from Coventry University's Studies in Adolescent Sexual Health (SASH) research group and the Serious Games Institute (SGI). Psychological targets for game content were identified through Intervention Mapping (IM) and the game design process was based on the Four-Dimensional Framework of Learning (4DF) emphasizing the context of deployment, learner profiling and the pedagogical perspective that influence the mode of representation of the learning content. Early efficacy testing of the game solution was validated through a cluster-randomized controlled trial in local schools (n = 505) indicated some positive outcomes in favour of the game-based approach, based on self-reported measures of psycho-social preparedness for avoiding coercion ($F [3, 501] = 15.306$, $p < .001$, $\eta p2 = 0.084$). Analysis of observation data suggests that blending this interactive game-based approach with traditional classroom delivery encouraged the teachers and students to engage in communal discussions and debriefing during and after game play. Together, the results demonstrated real benefits for pedagogy-driven game-based approaches to support the delivery of RSE within a classroom setting. (Abstract)

Bai, Y., Saint-Maurice, P.F., Welk, G.J., Russell, D.W., Allums-Featherston, K., & Candelaria, N. (2017). The longitudinal impact of NFL PLAY 60 programming on youth aerobic capacity and BMI, *American Journal of Preventive Medicine,* 52(3), 311-323.

Keywords: No keywords

Introduction: The NFL PLAY 60 campaign has actively promoted physical activity and healthy eating in youth through programs such as the PLAY 60 Challenge and Fuel Up to PLAY 60. The purpose of the study was to evaluate the impact of NFL PLAY 60 programming on longitudinal trajectories of youth aerobic capacity and BMI.

Study design: Data were from the NFL PLAY 60 FitnessGram Partnership Project, a large participatory research project designed to promote physical activity and healthy eating among Kindergarten through 12th grade children and adolescents.

Setting/participants: The programming was led by teachers in school settings across 32 NFL franchise markets. A range of 50,000–100,000 students from 497 schools completed FitnessGram assessments annually starting in 2011 and continuing through 2015. The analysis was conducted in 2015.

Intervention: Adoption of NFL PLAY 60 programming was encouraged but not required and the program implementation was evaluated each year. The adoption was evaluated through self-reported annual survey.

Main outcome measures: School assessments of aerobic capacity and BMI were evaluated using FitnessGram standards to calculate the percentage of students meeting the Healthy Fitness Zone for each test. Growth curve modeling was used to estimate the longitudinal trajectories.

Results: About 19% of schools were classified as programming schools. Annual improvements in aerobic capacity were significantly greater in schools that participated in the programs for both girls (3.0%, $p<0.01$) and boys (2.9%, $p<0.01$) compared with non-programming schools. The annual improvements in BMI Healthy Fitness Zone achievement were also higher in girls (1.3%, $p<0.05$) and in boys (1.2%, $p<0.05$) from schools that participated in the programs versus non-participating schools. Schools that implemented the programs for the entire 4-year period tended to have better improvements in aerobic capacity than schools enrolled for only 2 or 3 years ($p<0.05$).

Conclusions: The results of these longitudinal analyses support the utility of the NFL PLAY 60 physical activity promotion programs for improving youth aerobic capacity and potentially helping to reverse the prevalence of overweight/obesity. However, the overall program adoption rate is low. (Abstract)

Bates, M. (2015). Designing location-based gaming applications with teenagers to address early school leaving. In *Proceedings of the European Conference on Games-based Learning* (pp.50 – 57).

Keywords: ARIS; early school leaving; employability; location-based games; participatory design

Early school leaving (ESL) is an urgent and serious problem, both for individuals and society as a whole. Factors such as learning difficulties, social problems or a lack of motivation, guidance or support all contribute to ESL, although the situation varies across EU countries. High rates of ESL are detrimental to making lifelong learning a reality and increase the risk of unemployment, poverty and social exclusion. Since normally there is not a unique reason for leaving education or vocational training, answers are no easy. In response to these concerns, the Code RED project (http://www.coderedproject. eu) has been created to address the high proportion of drop out from Initial Vocational Education and Training (IVET) and ESL in the UK, Greece, Italy and Cyprus via the development of new games-based learning applications (both desktop and mobile) to inform young adults (aged 16+) of the issues surrounding ESL. Location-based gaming (LBG) applications represent a form of play that is designed to be undertaken on a device in motion which changes the game experience based on the location. The design of these products presents many challenges to developers surrounding user interfaces, processing power and the availability of space. The ARIS platform (Augmented Reality and Interactive Storytelling) covers a broad field of LBG design components such as geo-location data, location-sensitive informational objects, interactive dialogues and QR code input. As such, ARIS has been selected by Code RED researchers to teach LBG and mobile augmented reality design concepts and prototype new design ideas with young adults. This paper will discuss the issues which are contributing to ESL within the EU and report upon the results of a short term participatory design initiative within Code RED to co-design new location-based gaming applications with participating IVET students (aged 14+) to address these issues. In the UK, participating students were successful in formulating a game concept suitable for transfer into LBG surrounding lifestyle choices such as alcohol and drug abuse which may contribute to ESL. In Greece,

participating students with learning disabilities were successful in creating a fictional 'solve the mystery' LBG using the ARIS platform. Students decided to focus the game's narrative on the issue of exclusion from school and jumping into fast conclusions during schooling years. In Italy, participating children were successful in designing an orienteering-based LBG to promote cultural heritage via exploration of an ancient castle. This process also enabled participants to research and learn more about this local landmark. The paper will discuss the application of the participatory design methodology between project partners and will document the LBG output from this process. Finally, the paper will identify how these products will be positioned as part of future work to address ESL. (Abstract)

Benton, L., Johnson, H., Brosnan, M., Ashwin, E., & Grawemeyer, B. (2011, May). IDEAS: an interface design experience for the autistic spectrum. In *CHI'11 Extended Abstracts on Human Factors in Computing Systems, Conference Proceedings and Extended Abstracts* (pp.1759 – 1764). ACM. DOI: 10.1145/1979742.1979841

Keywords: autism; children; interface design; participatory design

Designing products and services to meet the specific requirements of children with Autism Spectrum Disorder (ASD) can be difficult due to their wide ranging and individual needs. Participatory Design (PD) is a design method that could be used to better meet these needs, by giving this population an opportunity to directly contribute to software designed for their use. Researchers have begun to involve children with ASD in the design process, but there is not yet a design method specifically adapted to support the potential difficulties this group may experience during PD sessions. This paper presents a new design method, IDEAS, which attempts to fulfil this need. The development of this method is described along with an initial pilot undertaken to determine the feasibility of using this method with an ASD population. The results indicate that the majority of children with ASD were able to produce a successful final design using this method, and have the potential to be involved in PD sessions as part of a design team. (Abstract)

Benton, L., & Johnson, H. (2015). Widening participation in technology design: A review of the involvement of children with special educational needs and disabilities. *International Journal of Child-Computer Interaction,* 3, 23 - 40. DOI: 10.1016/j.ijcci.2015.07.001

Keywords: technology design process; participatory design; children; special educational needs; disabilities

This article presents a review of the design methods and techniques that have been used to involve children with special educational needs and/or disabilities (SEND) in the technology design process. Situating the work within the established child–computer interaction research sub-field of participatory design, we examine the progress that has been made in relation to the participation of this specific child population. An extensive review of the literature in this area has been undertaken and we describe the different roles, responsibilities and activities that have been undertaken by both the child and adult participants within previous technology design projects. We also highlight the different types of outcome from this previous work involving children with SEND, exploring the impact the children's participation has had on both the resulting technology as well as the impact on the child participants themselves. Finally we conclude this review with a set of reporting recommendations for technology designers and researchers aiming to involve this population in future technology design projects. (Abstract)

Bonsignore, E. et al. (2016). Traversing transmedia together: Co-designing an educational alternate reality game for teens, with teens. In *Proceedings of the 15th International Conference on Interaction Design and Children (IDC '16)* (pp.11 – 24). ACM, New York, NY, USA. DOI: 10.1145/2930674.2930712

Keywords: alternate reality games; adolescents; co-design; learning; participatory design; teens; transmedia storytelling

An Alternate Reality Game (ARG) is an interactive story game hybrid whose core mechanics include collaborative problem solving and storytelling. ARGs are also participatory experiences, because game designers dynamically adjust content in response to players' actions as game play progresses. What if the participatory process was extended during the design phase of an ARG as well? Few, if any, studies have explored how to include player populations in the ARG design process -- especially ARGs that target youth. In this paper, we share the process we followed to design a large-scale ARG to promote scientific inquiry for teenagers (13-17 years old) by partnering with them. Our findings suggest that co-designing with youth resulted in novel design features in the final game, and gave us insight into adolescent attitudes toward various scientific concepts. We also share co-design techniques that were not as effective and offer suggestions for future approaches. (Abstract)

Bossavit, B., Parsons, S. (2016, August). Designing an educational game for and with teenagers with high functioning autism. In *Proceedings of the 14th Participatory Design Conference: Full papers*, 1 (pp.11 – 20). ACM. DOI: 10.1145/2940299.2940313

Keywords: autism; educational game; natural user interface; participatory design

This paper describes a Participatory Design approach which involved teenagers with High functioning Autism in the design of an educational game to learn about Geography via the use of Natural User Interfaces. We designed sessions with specific activities which were guided by the interaction between the teachers and students on the day. The corresponding activities implicitly shaped the roles that each stakeholder undertook such as user, informant, tester, co-designer, motivator or facilitator. As a result, adults and young people together designed and tested a digital educational game based on their expertise as programmers, teachers, and video gamers, respectively. The project took place in a highly specialized school for young people with Special Educational Needs. This paper contributes by highlighting the importance of supporting students to participate on their own terms. Moreover, equity in participation is not about sharing all decisions but about managing and respecting the different types of expertise that each partner brings to the design team. (Abstract)

Bossavit, B., Parsons, S. (2016). "This is how I want to learn": High Functioning Autistic Teens Co-Designing a Serious Game. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)* (pp.1294 – 1299). ACM, New York, NY, USA, DOI: 10.1145/2858036.2858322

Keywords: autism; educational game; natural user interface; participatory design

This paper presents a project that developed a Serious Game with a Natural User Interface, via a Participatory Design approach with two adolescents with High-Functioning Autism (HFA). The project took place in a highly specialized school for young people with Special Educational Needs (SEN). The teenagers were empowered by assigning them specific roles across several sessions. They could

express their voice as user, informant, designer and tester. As a result, teachers and young people developed a digital educational game based on their experience as video gamers to improve academic skills in Geography. This paper contributes by describing the sensitive and flexible approach to the design process which promoted stakeholders' participation. (Abstract)

Bossavit, B., Parsons, S. (2017). From start to finish: Teenagers on the autism spectrum developing their own collaborative game. *Journal of Enabling Technologies*, 11(2), 31-42. DOI: 10.1108/JET-02-2017-0004

Keywords: autism; collaborative game; game design; kudo; participatory design; student voice

Purpose: The purpose of this paper is to investigate how teenagers on the autism spectrum respond to their involvement in the creation of a collaborative game, meeting the curriculum requirements in programming at secondary level in England.

Design/methodology/approach: Two autistic teenagers were involved in participatory design processes to elaborate and develop together a collaborative game of their choice using the visual programming software, Kodu Game Lab.

Findings: With the support of adults (teachers and the researcher), the participants were able to demonstrate and strengthen their participation, problem-solving and programming skills. The participants expressed their preferences through their attitudes towards the tasks. They created a game where the players did not need to initiate any interaction between each other to complete a level. Furthermore, the students naturally decided to work separately and interacted more with the adults than with each other.

Research limitations/implications: This is a small case study and so cannot be generalised. However, it can serve as starting point for further studies that involve students with autism in the development of interactive games.

Practical implications: It has been shown that disengaged students can develop various skills through their involvement in software programming.

Originality/value: Overall, this paper presents the involvement of teenagers on the autism spectrum in the initial design and development of a collaborative game with an approach that shaped, and was shaped by, the students' interests. Although collaboration was emphasised in the intended learning outcomes for the game, as well as through the design process, this proved difficult to achieve in practice suggesting that students with autism may require stronger scaffolding to engage in collaborative learning. (Abstract)

Bowen, S., Sustar, H., Wolstenholme, D., & Dearden, A. (2013). Engaging teenagers productively in service design. *International Journal of Child-Computer Interaction*, 1(3), 71- 81. DOI: 10.1016/j.ijcci.2014.02.001

Keywords: participatory design; service design; teenagers; diabetes

Engaging young people in participatory design can be challenging, particularly in health-related projects. In a study co-designing diabetes support and information services with teenagers, we found framing activities using popular culture was a useful strategy. Various cultural references helped us stage activities that were productive for the design process, and were engaging for our young

participants (e.g. exploring practical implications through discussions in a 'Dragons' Den'). Some activities were more effective than others and the idea of language-games, which has been widely explored in participatory design, explains why our strategy was successful when there was a clear 'family resemblance' between the popular cultural references and certain essential stages of designing. However, attention is required in selecting appropriate cultural references if this strategy is adopted elsewhere, and design facilitators should focus first on devising accessible language-games, rather than expecting popular cultural references to provide complete solutions to the challenge of staging participatory design. (Abstract)

Brizee, A., Sousa, M., & Driscoll, D. L. (2012). Writing centers and students with disabilities: The user-centered approach, participatory design, and empirical research as collaborative methodologies. *Computers and Composition*, 29(4), 341 - 366. DOI: 10.1016/j.compcom.2012.10.003

Keywords: Online Writing Lab (OWL); writing Center; writing lab; user-centered design; students with disabilities; accessibility; usability; user-testing; participatory design; collaboration; universal design; empirical research

This article discusses issues of accessibility and how user-centered and participatory approaches can inform empirical research to guide the Universal Design of virtual spaces and influence writing center efforts for students with disabilities. Because this article describes how to integrate usability/accessibility testing for online and in-person services, it can work as a model for writing centers struggling with the challenges of serving students with disabilities. Toward this end, the article discusses two generations of usability testing on a large, well-established online writing lab (the Purdue OWL), as well as the collaborative projects that emerged between the usability team and campus disabilities services as a result of this testing. The article concludes with heuristics and generative questions that may assist readers in developing similar projects tailored to their own contexts. (Abstract)

Brondino, M., Dodero, G., Gennari, R., Melonio, A., Pasini, M., Raccanello, D., & Torello, S. (2015). Emotions and Inclusion in Co-design at School: Let's Measure Them! *Methodologies and Intelligent Systems for Technology Enhanced Learning*, 374, 1-8. Springer, Cham. DOI: 10.1007/978-3-319-19632-9_1

Keywords: game design; co-design; gamification; cooperative learning; experience design; emotional engagement; inclusion; measure; children; schools

Co-design with children comes with methods and techniques for creating technological products with children, such as video-game prototypes. When co-design takes place in schools, learners' involvement and enjoyment of co-design become crucial concerns for researchers. But how to measure emotions, more in general, and involvement in a co-design study with children? This paper presents a co-design study, run with a novel co-design method at school, for involving children in co-design groups and emotionally engaging them in producing game prototypes. It explains how emotional engagement and inclusion can be and were operationalized and measured in the co-design study, thereby providing feedback to co-design researchers interested in measuring the same constructs. (Abstract)

Caon M. et al. (2015) Towards an Engaging Mobile Food Record for Teenagers. In *Murino V., Puppo E., Sona D., Cristani M., Sansone C. (eds) New Trends in Image Analysis and Processing* --

***ICIAP 2015 Workshops. ICIAP 2015. Lecture Notes in Computer Science*, 9281, 417-424. Springer, Cham. DOI: 10.1007/978-3-319-23222-5_51**

Keywords: No keywords

In the frame of the PEGASO European project, we aim at promoting healthier lifestyles among teenagers focusing on the alimentary education and physical activity. This paper presents a novel concept of mobile food record developed following a multidisciplinary approach to innovate both the monitoring and the user experience. This mobile food record does not count calories but is focused on tracking dietary patterns and support the adoption of target behaviours. Moreover, the introduction of game mechanics developed through participatory design techniques aims at sustaining engagement in the long term. (Abstract)

Caro, K., Tentori, M., Martinez-Garcia, A. I., & Zavala-Ibarra, I. (2017). FroggyBobby: An exergame to support children with motor problems practicing motor coordination exercises during therapeutic interventions. *Computers in Human Behavior,* 71, 479-498. DOI: 10.1016/j.chb.2015.05.055

Keywords: autism; children; exergames; gameful design; motor coordination

Children with motor coordination problems exhibit impairments in gross-motor eye-body coordination. Exergames are good in supporting motor therapeutic interventions. However, available exergames are not designed to support the needs of these children, presenting excessive cognitive load and suggesting practice of inappropriate body interactions. In this work, we investigate the design of exergames to support children with motor problems during gross-motor therapeutic interventions. We followed an iterative user-centered design methodology to design FroggyBobby – an exergame to support children with motor problems when practicing eye-body coordination exercises. Our design involved two qualitative studies: a study to understand the problem space, and a study to validate an initial design of FroggyBobby. Additionally, we held participatory design sessions to uncover the gameful mechanisms and appropriate motor coordination exercises to support motor therapeutic interventions. To evaluate FroggyBobby, we conducted a deployment study with children with low-functioning autism presenting motor problems and psychologist-teachers at a school-clinic for autism. FroggyBobby was found easy to use, fun, and engaging by children with autism and teachers. Psychologist-teachers perceived FroggyBobby impacted motor functioning, socialization and body awareness, and successfully supported motor therapeutic interventions. We close reflecting how our results present new insights from a design, technical, and therapeutic point of view. (Abstract)

Cassidy, B., Sim, G., Horton, M., & Fitton, D. (2015, September). Participatory design of wearable augmented reality display elements for children at play. In *Computer Science and Electronic Engineering Conference (CEEC), 2015 7th* (pp. 53 – 58). IEEE. DOI: 10.1109/CEEC.2015.7332699

Keywords: augmented reality; children; play; wearable displays

This paper presents the findings of a low-fidelity participatory design activity for the design of wearable Augmented Reality (AR) experiences for children at play. The aims of the research were to gain insights into the different types of augmentations children find engaging and useful in different play contexts. The papers contribution is both the method used, and the insights gained from the

design session. Using the method outlined the paper, young children were able to successfully understand the concept of augmented reality and communicate their ideas for the design of AR play experiences without first seeing a concrete example of wearable display technology. The children designed for three distinct types of play experience, Constructive play, Role play and Creative play. The children used the design packs assembled by the researchers to express their ideas. These were then coded by four experienced Child Computer Interaction (CCI) researchers to analyze the artifacts created by the children. We identify 10 design themes for AR artifacts in play and discuss the frequency of artifacts found within these themes across the different types of play investigated. (Abstract)

Clarke, S., Arnab, S., Dunwell, I., & Brown, K. (2012). PR: EPARe: A game-based approach to relationship guidance for adolescents. *Procedia Computer Science*, 15, 38-44. DOI: 10.1016/j.procs.2012.10.056

Keywords: relationship education; participatory design; serious games; blended learning; game-based intervention

Ensuring adolescents are equipped with the necessary skills to handle coercion and pressure from peers is a central component of effective relationship education. However, for teachers attempting to convey these principles, didactic methods have been shown to meet with limited success, as the highest-risk students may fail to engage with the subject matter in a meaningful fashion. In this paper, the potential a digital game may hold as a component of a blended learning solution to this problem is explored though the development of PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships). Adopting a participatory design approach, designers considered relevant input from stakeholders, subject experts, teachers and students in the development of PR:EPARe. Participatory involvement has allowed the game to be developed in such a way that draws focus on the role of the end user to extend from the traditional concern of the student's learning needs to consider that of the practitioner's needs as another primary condition of successful game based learning. An examination of the first section of the PR:EPARe game is undertaken through a cluster randomized control trial of 507 students across three UK schools. Using ANOVA to demonstrating significant differences between control and game groups ($p<0.05$) for responses to a range of questions on preparedness and self-efficacy. An overall significant positive effect of the game over time when compared to the control ($p<0.001$) is observed. Based on these preliminary findings, the participatory approach to development is shown to lead to a developed game which is well- received by students, offering the potential to provide a valuable resource for teachers attempting to address this difficult subject within a classroom-based context. (Abstract)

Constantin, A., Johnson, H., Smith E., Lengyel, D., & Brosnan, M. (2017). Designing computer-based rewards with and for children Autism Spectrum Disorder and/or intellectual disability. *Computers in Human Behavior*, 75, 404-414.

Keywords: Autism Spectrum Disorders; intellectual disability; rewards; participatory design; computer-assisted learning; technology; design

Children with Autism Spectrum Disorder (ASD) tend to have an affinity for digital technologies, often preferring computer-assisted learning to human-assisted learning. Many children with ASD are also diagnosed with Intellectual Disabilities (ID), yet design studies involving children with ASD and ID are scarce. Rewards can have a positive impact on children's learning and motivation, but little is known

about the nature and impact of rewards for children with ASD, and/or ID. Digital technologies are well placed to provide task-based rewards, and in combination with a better understanding of the reward preferences of children with ASD and/or ID this has significant potential to enhance learning. This paper presents two robust participatory design (PD) studies involving children with: i) ASD; ii) ID; and iii) both ASD and ID. The studies aimed to identify: i) the reward preferences of children with ASD and/or ID (RQ1) and ii) how rewards might develop throughout a task as the child progresses (RQ2). Results revealed a number of reward categories that were common to all children, as well as children's preferences for how rewards could develop as they progress through computer-based tasks, for the first time. Original implications for designing computer-based rewards embedded within digital intervention/educational technologies for children with ASD and/or ID, are discussed. (Abstract)

Culén, A., & Gasparini, A. (2012, September). Tweens with the iPad classroom—Cool but not really helpful? In *e-Learning and e-Technologies in Education (ICEEE), 2012 International Conference on* (pp. 1 – 6). IEEE. DOI: 10.1109/ICeLeTE.2012.6333771

Keywords: classroom ecology; cool technology; design with children; iPad

The iPad as a learning tool has made its way into many elementary school classrooms worldwide. It holds a promise to be a game changer in elementary school education supporting more constructivist learning practices. This paper offers an insight into what happened when in two elementary school classrooms the students were enabled to generate both content and context for their own learning. One of the cases describes the 6th grade elementary school children's involvement in a participatory design process aiming to design an application for the iPad. The application was to support learning about media production by enabling students to publish a weekly newsletter describing their school week in words, pictures and video. The second case is about how the 5th grade children influenced their teacher and obtained permission to use one of the iPads creativity apps over a two-week period in order to learn about writing. Both of these projects were part of two larger pilot studies following the introduction of the iPad into the elementary school classroom information ecology. The children participating in the studies evaluated the projects as truly successful. The children's criteria of success were how fun and enjoyable it was to use the iPad. The teachers did not find the projects to be successful. The main criterion they used was the learning outcome. Both teachers found the learning outcome to be inferior to what they usually obtain using traditional teaching methods. Both teachers preferred to use the iPad as a plug-on to traditional ways of teaching. Although our study is small, the results point towards issues that may be important for better understanding of the factors related to acceptance of the iPad as a learning tool. (Abstract)

Cumbo, B. J., Jacobs, B. C., Leong, T. W., & Kanstrup, A. M. (2014, December). What motivates children to play outdoors? Potential applications for interactive digital tools. In *Proceedings of the 26th Australian Computer-Human Interaction Conference on Designing Futures: the Future of Design* (pp. 168 – 171). ACM. DOI: 10.1145/2686612.2686637

Keywords: children; interactive digital technology; motivation; outdoor play; participatory design

Children (8-12 years) living in urban, western contexts are increasingly spending their free time indoors engaging in digital recreation, rather than outdoor, child-directed play. There is potential for

place-specific, digital technology to be designed to motivate children 'off the couch' and outdoors into their local natural places. This paper presents the outcomes of three workshops conducted with eleven children (8-12 years) in Aalborg, Denmark, designed to understand key motivators for outdoor play in children. Children were divided into five design groups. Fictional inquiry and a series of artefacts and triggers were used to communicate the design task to children and inspire a range of relevant designs. Here, we report on the design outcomes of workshops, the motivators for outdoor play, and potential applications for interactive digital technology to inspire more regular, outdoor play experiences in children. (Abstract)

Danielsson, K., & Wiberg, C. (2006). Participatory design of learning media: Designing educational computer games with and for teenagers. *Interactive Technology and Smart Education*, *3*(4), 275-291. DOI: 10.1108/17415650680000068

Keywords: educational computer game; participatory design; teenagers; multimedia design team; intrinsic motivation

This paper reports on how prospective users may be involved in the design of entertaining educational computer games. The paper illustrates an approach, which combines traditional Participatory Design methods in an applicable way for this type of design. Results illuminate the users' important contribution during game development, especially when intended for a specific target group. Unless prospective members of the target group are consulted it is difficult to foresee opinions of game content, aesthetics and the overall game experience of the users – aspects very much included or at least related to the theoretical concept of intrinsic motivation. Whereas pedagogical experts can contribute with learning content, the users are the ones who can state what is actually fun or not. Users' participation during the design process enables development of games that are directed to the learners and their expectations. The researchers collaborated with a multimedia design team in development of an educational web-based computer game, developed for the Swedish Broadcasting Corporation. (Abstract)

Derboven, J., Van Mechelen, M., & Slegers, K. (2015, April). Multimodal analysis in participatory design with children: a primary school case study. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 2825 – 2828). ACM. DOI: 10.1145/2702123.2702475

Keywords: multimodality; participatory design; values

We describe a multimodal method for the analysis of codesign outcomes in participatory design (PD) with children. The multimodal approach we take allows researchers to treat both verbal (notes, writings) and tangible material outcomes as complementary ways of communicating design ideas. We argue that an integrated approach in which both PD outcomes are compared and contrasted can result in a richer analysis, in which underlying values can be identified more clearly. To illustrate the method, we describe a PD process with primary school children. (Abstract)

Di Mascio, T., Melonio, A., Tarantino, L., & Vittorini, P. (2014). Many children and short project timing: How TERENCE harmonized these conflicting requirements. *Methodologies and Intelligent Systems for Technology Enhanced Learning,* 292, 69-76. Springer, Cham. DOI: 10.1007/978-3-319-07698-0_9

Keywords: No keywords

Involving children in the software design and development processes (using e.g., the user centered and the participatory design methodologies) is nowadays considered a key factor to obtain an accessible and usable technology enhanced learning system; but how children have to be efficiently involved is still an open question. In this paper we report the experience of a FP7-ICT European project, TERENCE, aimed at developing a system for improving text comprehension in children 7-11 years old. Our experience suggests to extend the repertoire of inquiry techniques with a new one able to harmonize two conflicting requirements of real projects: many children to involve vs project strict timing. (Abstract)

Dindler, C., Iversen, O. S., Smith, R., & Veerasawmy, R. (2010, November). Participatory design at the museum: inquiring into children's everyday engagement in cultural heritage. In *Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction* (pp. 72 – 79). ACM. DOI: 10.1145/1952222.1952239

Keywords: children; cultural heritage; everyday engagement; participatory design

We address the challenge of creating intersections between children's everyday engagement and museum exhibitions. Specifically we propose an approach to participatory design inquiry where children's everyday engagement is taken as the point of departure. We base our discussion on a design workshop - Gaming the Museum - where a primary school class was invited to participate in exploring future exhibition spaces for a museum, based on their everyday use of computer games and online communities. We reflect on the results of the workshop, and broadly discuss the everyday engagement of children as point of departure for designing interactive museum exhibitions. (Abstract)

Dodero, G., & Melonio, A. (2016). Guidelines for participatory design of digital games in primary school. *Methodologies and Intelligent Systems for Technology Enhanced Learning*, 478, 41-49. Springer, Cham. DOI: 10.1007/978-3-319-40165-2_5

Keywords: No keywords

Game design with children with a participatory approach has been receiving an increasing attention in recent years. However, game design as a complex design process poses several challenges especially when researchers or practitioners implement it within a learning context as a prolonged activity in time. This paper first outlines the background of game design and participatory game design with children. Then, it presents the approach used by the authors for participatory game design with primary school children. The experiences matured from previous field studies, executed applying the approach, resulted in a set of guidelines useful for practitioners and researchers for conducting participatory game design with primary school children. (Abstract)

Dodero, G., Gennari, R., Melonio, A., & Torello, S. (2014, October). Towards tangible gamified co-design at school: two studies in primary schools. In *Proceedings of the first ACM SIGCHI annual symposium on Computer-human interaction in play* (pp. 77 – 86). ACM. DOI: 10.1145/2658537.2658688

Keywords: children; co-design; empirical studies; engagement; game design; gamification; schools

Co-design is an ideal approach to design with users. It allows designers to create products, such as games, with their intended users and in their natural environment, e.g., children and their teachers in their school. Nowadays school contexts, however, pose their own requirements to co-design, which can affect its success. For instance, school contexts tend to be associated to boring rote by learners, who are used to interactive digital games. Gamification can then help in creating a positive engaging experience for school classes that co-design, as games do. This paper takes up such a view: it gamifies co-design contexts in order to positively engage school classes. To this end it presents two studies with gamified co-design in primary schools: heterogeneous teams co-designed prototypes by resolving missions as in a game, in the first short-term study; they did it in an even more gamified context, in the second long-term study. Results of both studies are encouraging for the approach. The paper also advances basic guidelines for tangibly gamifying co-design at school, grounded in the studies and literature. (Abstract)

Dodero, G., Gennari, R., Melonio, A., & Torello, S. (2014, April). Gamified co-design with cooperative learning. In *CHI'14 Extended Abstracts on Human Factors in Computing Systems* (pp. 707 – 718). ACM. DOI: 10.1145/2559206.2578870

Keywords: children; co-creation; co-design; cooperative learning; gamification of learning; learning context; participatory design; teachers

Co-design is an ideal approach to design with mixed teams that include learners and teachers. However, in modern learning contexts, learning and engagement are both key goals, and that poses several challenges to co-design. This paper investigates such challenges after outlining co-design and situating it in current user experience design trends. Then the paper uses the challenges to derive requirements for co-design, and shows how to meet requirements, fostering engagement as well as learning, by blending co-design with gamification and cooperative learning. It ends by showcasing a study that uses the blended co-design approach, and by outlining how this led to novel challenges and work. (Abstract)

Dodero, G., Gennari, R., Melonio, A., & Torello, S. (2015, September). There is no rose without a thorn: An assessment of a game design experience for children. In *Proceedings of the 11th Biannual Conference on Italian SIGCHI Chapter* (pp. 10-17). ACM. DOI: 10.1145/2808435.2808436

Keywords: gamification; children; cooperative learning; engagement; game design; inclusion; participatory design; schools

Game design is recently conducted at school for eliciting children's design ideas about games for them. However, game design is a complex interaction design task, requiring rather mature cognitive skills. This paper reflects on it, reporting a gamified game design experience with groups of children in primary schools. (Abstract)

Ekberg, J., Gursky, E.A., & Timpka, T., (2014). Pre-launch evaluation checklist for online health-promoting communities, *Journal of Biomedical Informatics, 47,* 11-17.

Keywords: community-based participatory research; health promotion; adolescents; health service

Background: Despite the apparent potential of online health-promoting communities (OHPC), there is limited guidance available for developers on the basic design features that contribute to successful

applications. The aim of this study was to develop a checklist for a pre-launch evaluation of OHPCs incorporating the perspectives of both the user and the health services communities.

Methods: The study was based on an action research design. Constructs previously applied to evaluate information system success were used as the basis for checklist development. The constructs were adapted for the OHPC context and formatively evaluated in a case study project. Evaluation data were collected from participatory observations and analyzed using qualitative methods.

Results: The initial OHPC checklist included the constructs information quality, service quality, and subjective norms. The contextual adaptation of the information quality construct resulted in items for content area, trust, and format; the adaptation of the service quality construct in items for staff competence, prompt service and empathy; and the adaptation of the subject norms construct in items for social facilitation, interconnectivity and communication. The formative evaluation demonstrated the critical need to balance the autonomy of the online community with the professional control of health services quality expressed in the information and service quality constructs.

Conclusions: A pre-launch OHPC evaluation checklist has been designed for use in practical development of health promotion web resources. Research on instruments for OHPC evaluations is warranted. (Abstract)

Fage, C., Pommereau, L., Consel, C., Balland, E., & Sauzéon, H. (2016). Tablet-based activity schedule in mainstream environment for children with autism and children with ID. *ACM Transactions on Accessible Computing (TACCESS)*, 8(3), 9:1-9:26. DOI: 10.1145/2854156

Keywords: educative inclusion in mainstream environment; idiosyncratic multimedia contents; participatory design

Including children with autism spectrum disorders (ASD) in mainstream environments creates a need for new interventions whose efficacy must be assessed in situ. This article presents a tablet-based application for activity schedules that has been designed following a participatory design approach involving mainstream teachers, special education teachers, and school aides. This application addresses two domains of activities: classroom routines and verbal communications. We assessed the efficiency of our application with two overlapping user studies in mainstream inclusion, sharing a group of children with ASD. The first experiment involved10children with ASD, where five children were equipped with our tabled-based application and five were not equipped. We show that (1) the use of the application is rapidly self-initiated (after 2 months for almost all the participants) and (2) the tablet supported routines are better performed after 3 months of intervention. The second experiment involved 10 children equipped with our application; it shared the data collected for the five children with ASD and compared them with data collected for five children with intellectual disability (ID). We show that (1) children with ID are not autonomous in the use of the application at the end of the intervention, (2) both groups exhibited the same benefits on classroom routines, and (3) children with ID improve significantly less their performance on verbal communication routines. These results are discussed in relation with our design principles. Importantly, the inclusion of a group with another neurodevelopmental condition provided insights about the applicability of these principles beyond the target population of children with ASD. (Abstract)

Frauenberger, C., Good, J., & Alcorn, A. (2012, June). Challenges, opportunities and future perspectives in including children with disabilities in the design of interactive technology. In *Proceedings of the 11th International Conference on Interaction Design and Children* (pp. 367 – 370). ACM. DOI: 10.1145/2307096.2307171

Keywords: children; design research; disabilities; participatory design

In this paper we discuss participatory approaches to designing interactive technologies for children with disabilities. While participatory design (PD) has been increasingly influential in the field of Human-Computer Interaction as a whole, applying its methods and theories to children with disabilities raises challenges specific to this target group and poses more fundamental questions about the limits of PD. We will first build the underlying argument of why we believe PD is particularly important when designing for children with disabilities, before discussing the challenges and opportunities that come with implementing PD in this context. We ground this discussion in our own experiences with developing a learning environment for children with autism spectrum conditions (ASC). We then consider future perspectives and develop research questions by reflecting on our experiences. (Abstract)

Furtado, A. W. B., Falcão, T. P., Gomes, A. S., Eduardo, C., Rodrigues, M., & Sonnino, R. (2008, February). E-du box: Educational multimedia with tangible-enhanced interaction. In *Proceedings of the 7th ACM Conference on Designing Interactive Systems* (pp. 139 – 146). ACM. DOI: 10.1145/1394445.1394460

Keywords: educational software; literacy; participatory design; social technology; tangible interaction

Media resources usage has significant impact on children literacy in the first school years in Brazil [5]. Computer software and tangible interfaces can help engage pupils in effective learning activities. Tangible interfaces built with familiar objects of our everyday lives such as wood and tissues are well accepted by pupils. In this work, we detail our design and evaluation of e-du box - an educational, authoring and sharing multimedia platform including a tangible companion that provides feedback for users. We employed a participatory design process based on providing supports intended to help children engage in different tasks. We could elicit a list of design guidelines for this specific application. We discuss our experience with this design approach and explore its implications. (Abstract)

Gennari, R., Melonio, A., Raccanello, D., Brondino, M., Dodero, G., Pasini, M., & Torello, S. (2017). Children's emotions and quality of products in participatory game design. *International Journal of Human-Computer Studies*, 101, 45-61. DOI: https://doi.org/10.1016/j.ijhcs.2017.01.006

Keywords: game design; participatory design; gamification; cooperative learning; quality of product; performance; emotions; engagement; children's

The paper presents an empirical study centred on a participatory game design activity with 8–10 years old primary-school children, split in different sessions. The study assesses how children perform in game design and whether they are engaged in design tasks. To this end, the study gathers data concerning the quality of children's game design products, regarded as indicators of children's performance in game design. It collects data concerning children's emotions, which are taken as indicators of their engagement in game design. The paper statistically analyses and discusses how

emotions and quality of products evolve across the game design experience, and how emotions are related to children's quality of products. Results of this work can help researchers, educators and practitioners manage a complex design experience with and for children, and identify key emotions for promoting quality of design work. (Abstract)

Gerling, K. M., Linehan, C., Kirman, B., Kalyn, M. R., Evans, A. B., & Hicks, K. C. (2016). Creating wheelchair-controlled video games: Challenges and opportunities when involving young people with mobility impairments and game design experts. *International Journal of Human-Computer Studies*, 94, 64-73. DOI: https://doi.org/10.1016/j.ijhcs.2015.08.009

Keywords: participatory design; game design; accessibility; use of wheelchairs

Although participatory design (PD) is currently the most acceptable and respectful process we have for designing technology, recent discussions suggest that there may be two barriers to the successful application of PD to the design of digital games: First, the involvement of audiences with special needs can introduce new practical and ethical challenges to the design process. Second, the use of non-experts in game design roles has been criticised in that participants lack skills necessary to create games of appropriate quality. To explore how domain knowledge and user involvement influence game design, we present results from two projects that addressed the creation of movement-based wheelchair-controlled video games from different perspectives. The first project was carried out together with a local school that provides education for young people with special needs, where we invited students who use wheelchairs to take part in design sessions. The second project involved university students on a game development course, who do not use wheelchairs, taking on the role of expert designers. They were asked to design concepts for wheelchair-controlled games as part of a final-year course on game design. Our results show that concepts developed by both groups were generally suitable examples of wheelchair-controlled motion-based video games, but we observed differences regarding level of detail of game concepts, and ideas of disability. Additionally, our results show that the design exercise exposed vulnerabilities in both groups, outlining that the risk of practical and emotional vulnerability needs to be considered when working with the target audience as well as expert designers. (Abstract)

Girard, S., & Johnson, H. (2011, October). Designing affective animations with children as design partners using role-playing. In *Proceedings of the 23rd Conference on l'Interaction Homme-Machine* (pp. 26:1 – 26:8). ACM. *DOI: 10.1145/2044354.2044386*

Keywords: affect; children; educational games; requirements; user-centred design

This paper describes a user-centred participatory-design method, novel to the domain of interaction design of affective components for learning, for gathering user requirements from children. The method was considered to be suitable and appealing for children in terms of participating in design, and led to the definition of a sample of digital animations that portray a set of emotional states. The method's main novelty lies in the use of real actors as design partners to express affect, and includes comic strips in the data gathered. This method is believed of value for future design of affective components in educational context by, and for, children. (Abstract)

Grootens-Wiegers, P., de Vries, M.C., van Beusekom, M.M., van Dijck, L., van den Broek, J.M. (2015). Comic strips help children understand medical research: Targeting the informed consent procedure to children's needs, *Patient Education and Counselling*, 98(4), 518-524.

Keywords: research information; informed consent; children; adolescents; participation

Objective: Children involved in medical research often fail to comprehend essential research aspects. In order to improve information provision, a participatory approach was used to develop new information material explaining essential concepts of medical research.

Methods: A draft of a comic strip was developed by a science communicator in collaboration with pediatricians. The draft was presented to children participating in a clinical trial and to two school classes. Children were consulted for further development in surveys and interviews. Subsequently, the material was revised and re-evaluated in four school classes with children of varying ages and educational levels.

Results: In the first evaluation, children provided feedback on the storyline, wording and layout. Children thought the comic strip was 'fun' and 'informative'. Understanding of 8 basic research aspects was on average 83% and all above 65%, illustrating that children understood and remembered key messages.

Conclusion: A comic strip was developed to support the informed consent process. Children were consulted and provided feedback. The resulting material was well understood and accepted.

Practice implications: Involving children in the development of information material can substantially contribute to the quality of the material. Children were excited to participate and to 'be a part of science'. (Abstract)

Guha, M. L., Druin, A., & Fails, J. A. (2010, June). Investigating the impact of design processes on children. In *Proceedings of the 9th International Conference on Interaction Design and Children* (pp. 198 – 201). ACM. DOI: 10.1145/1810543.1810570

Keywords: children; design processes; cooperative inquiry

While there is a wealth of information about children's technology and the design processes used to create it, there is a dearth of information regarding how the children who participate in these design processes may be affected by their participation. In this paper, we motivate why studying this impact is important and look at the foundation provided by past research that touches on this topic. We conclude by briefly proposing methods appropriate for studying the impact of the design process on the children involved. (Abstract)

Hernandez, H. A., Ye, Z., Graham, T. C., Fehlings, D., & Switzer, L. (2013, April). Designing action-based exergames for children with cerebral palsy. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1261 – 1270). ACM. DOI: 10.1145/2470654.2466164

Keywords: children with cerebral palsy; exergame; video game design

Children with cerebral palsy (CP) want to play fast-paced action-oriented videogames similar to those played by their peers without motor disabilities. This is particularly true of exergames, whose physically-active gameplay matches the fast pace of action games. But disabilities resulting from CP can make it difficult to play action games. Guidelines for developing games for people with motor disabilities steer away from high-paced action, including recommendations to avoid the need for time-sensitive actions and to keep game pace slow. Through a year-long participatory design process

with children with CP, we have discovered that it is in fact possible to develop action-oriented exergames for children with CP at level III on the Gross Motor Function Classification Scale. We followed up the design process with an eight-week home trial, in which we found the games to be playable and enjoyable. In this paper, we discuss the design of these games, and present a set of design recommendations for how to achieve both action-orientation and playability. (Abstract)

Holone, H., & Herstad, J. (2013, April). Three tensions in participatory design for inclusion. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2903 - 2906). ACM. DOI: 10.1145/2470654.2481401

Keywords: familiarity; inclusion; participatory design; universal design

One ideal of Participatory Design (PD) is active involvement by all stakeholders as co-designers. However, when PD is applied to real projects, certain compromises are unavoidable, no matter what stakeholders are involved. With this paper we want to shed light on some of the challenges in implementing "true" PD in the case of designing with children, in particular children with severe disabilities. We do this work to better understand challenges in an ongoing project, RHYME, and by doing so we hope to provide insight and inspiration for others. (Abstract)

Horton, M., Read, J. C., Mazzone, E., Sim, G., & Fitton, D. (2012, May). School friendly participatory research activities with children. *CHI'12 Extended Abstracts on Human Factors in Computing Systems*, 2099 - 2104. ACM. DOI: 10.1145/2212776.2223759

Keywords: children; evaluation; group work; participatory design; school

Participatory Design is a common practice in HCI and user based evaluations are also highly recommended. This paper looks at the practice of carrying out design and evaluation sessions with school aged children by describing a general method for carrying out and arranging whole class activities that are school friendly and then by analyzing the academic value of these activities. An analysis of 6 MESS days with 21 activities yielded a research out of 9 publications at a research output of 43%. (Abstract)

Howland, K., & Good, J. (2015). Learning to communicate computationally with Flip: A bi-modal programming language for game creation, *Computers & Education,* 80, 224-240.

Keywords: evaluation of CAL systems; interactive learning environments; programming and programming languages; secondary educations

Teaching basic computational concepts and skills to school children is currently a curricular focus in many countries. Running parallel to this trend are advances in programming environments and teaching methods which aim to make computer science more accessible, and more motivating. In this paper, we describe the design and evaluation of Flip, a programming language that aims to help 11–15 year olds develop computational skills through creating their own 3D role-playing games. Flip has two main components: 1) a visual language (based on an interlocking blocks design common to many current visual languages), and 2) a dynamically updating natural language version of the script under creation. This programming-language/natural-language pairing is a unique feature of Flip, designed to allow learners to draw upon their familiarity with natural language to “decode the code”. Flip aims to support young people in developing an understanding of computational concepts as well as the skills to use and communicate these concepts effectively. This paper investigates the

extent to which Flip can be used by young people to create working scripts, and examines improvements in their expression of computational rules and concepts after using the tool. We provide an overview of the design and implementation of Flip before describing an evaluation study carried out with 12–13 year olds in a naturalistic setting. Over the course of 8 weeks, the majority of students were able to use Flip to write small programs to bring about interactive behaviours in the games they created. Furthermore, there was a significant improvement in their computational communication after using Flip (as measured by a pre/post-test). An additional finding was that girls wrote more, and more complex, scripts than did boys, and there was a trend for girls to show greater learning gains relative to the boys. (Abstract)

Ioannidi, D., Zidianakis, E., Antona, M., & Stephanidis, C. (2017). Designing Games for Children with developmental disabilities in Ambient Intelligence Environments. *International Journal of Child-Computer Interaction*, 11, 40 - 49. DOI: 10.1016/j.ijcci.2016.10.008

Keywords: ambient intelligence; interactive games; developmental disorders; early intervention services; occupational therapy

This paper presents the design process and deployment of interactive games for children within an Ambient Intelligence (AmI) environment. Designing and creating games under the perspective of Ambient Intelligence has the potential to provide enhanced indoor playing experiences to children, as well as maintaining and expanding the applicability of each game as a tool in early intervention services such as preschool and special education. The developed games build on knowledge stemming from the processes and theories used in Occupational Therapy, are capable of monitoring and following the progress of each young player, adapt accordingly and provide important information regarding the abilities and skills of a child and his development over time. The design has been conducted in collaboration with occupational therapists so as to embed aspects of their work and therapeutic procedures. (Abstract)

Isola, S., & Fails, J. A. (2012, June). Family and design in the IDC and CHI communities. In *Proceedings of the 11th International Conference on Interaction Design and Children* (pp. 40 – 49). ACM. DOI: 10.1145/2307096.2307102

Keywords: design methods; design partner; informant; roles of design; technology for families; tester; user

As members of the HCI community we strive to design technologies that will benefit its intended users whether they are children, young adults, or older adults. The focus of this paper is to survey research related to technologies for families. In so doing we selected papers relating to technologies for families from all nine years of Interaction Design and Children (IDC) community (2003-2011) and then papers from the past 16 years of the larger Human Factors in Computing Systems (CHI) community (1996-2011). We present a survey of the design methods used in these papers. We identify trends in the technologies and identify the need for further exploration in the realm of participatory design for families. (Abstract)

Itenge-Wheeler, H., Kuure, E., Brereton, M., & Winschiers-Theophilus, H. (2016). Co-creating an enabling reading environment for and with Namibian children. *Proceedings of the 14th Participatory Design Conference: Full papers,* 1, 131 - 140. ACM. DOI: 10.1145/2940299.2940315

Keywords: children; design collaborative; participatory design; reading culture; workshop

Namibian children's appreciation of literature is falling behind. While children develop functional literacy, enough to search the web and read for information finding, their skills plateau due to their limited forms of reading. Thus this paper draws on a participatory approach with different stakeholders aiming to co-create a stimulating and enabling reading environment for Namibian children.

Four different participatory workshops were designed to discover ways to deepen the reading culture, in particular by exploring contexts in which children would read and also author books. Acknowledging the different roles of stakeholders in an ongoing national agenda of enhancing the Namibian reading culture, it becomes clear that the various aspirations of children as expressed in their designs need to be accounted for, interpreted and translated into a feasible plan of action. The paper outlines a way of using participatory design workshops at a number of levels to obtain design inspirations for further interventions towards enhancing kids' reading experiences. (Abstract)

Iversen, O. S., & Dindler, C. (2013). A Utopian agenda in child–computer interaction. *International Journal of Child-Computer Interaction*, 1(1), 24-29. DOI: 10.1016/j.ijcci.2012.08.002

Keywords: No keywords

While participatory techniques and practices have become commonplace in parts of the Child-Computer Interaction (CCI) related literature we believe that the tradition of Participatory Design has more to offer CCI. In particular, the Scandinavian Cooperative Design tradition, manifested through the Utopia project, provides a valuable resource for setting an agenda for CCI research that explicitly addresses ideals and values in research and practice. Based on a revisit of the Utopia project we position the ideals of democracy, skilfulness, and emancipation as the core ideals of a Utopian agenda and discuss how these resonate with issues and challenges in CCI research. Moreover, we propose that a Utopian agenda entails an explicit alignment between these ideals, a participatory epistemology, and methodology in terms of tools and techniques in CCI practice. (Abstract)

Iversen, O. S., Dindler, C., & Hansen, E. I. K. (2013). Understanding teenagers' motivation in participatory design. *International Journal of Child-Computer Interaction*, 1(3), 82 - 87. DOI: 10.1016/j.ijcci.2014.02.002

Keywords: teenagers; tools of engagement; participatory design; motivation; motives

Engaging children in the design of digital technology is one of the core strands in child–computer interaction literature. However, few studies explore how teenagers as a distinct user group are engaged in Participatory Design activities. Based on a case study comprising ten Participatory Design workshops with teenagers (13–15 years old), we identified a range of tools that designers employed in order to engage the teenagers actively in Participatory Design: rewards, storytelling, identification, collaboration, endorsement, technology, and performance. Although these tools were realized through the use of well-established Participatory Design methods and techniques, a deeper understanding of teenagers' motivation and motives is essential to understanding how tools and techniques may be made to support teenagers' motivation. We propose a Cultural–Historical Activity Theory approach to teenagers' motives and motivation as a framework for understanding how various tools may be employed to engage teenagers in Participatory Design activities. (Abstract)

Kalmpourtzis, G., Vrysis, L., & Veglis, A. (2016, October). Teaching game design to students of the early childhood through Forest Maths. In *Semantic and Social Media Adaptation and Personalization (SMAP), 2016 11th International Workshop on* (pp. 123 – 127). IEEE. DOI: 10.1109/SMAP.2016.7753396

Keywords: early childhood; game based learning; game design; human computer interaction; participatory design

As technology infiltrates every aspect of students' daily lives, game design acquires a bigger and more influential impact on shaping students' personalities and development of learning competencies. Considering the continuously increasing research on the use of educational games in classrooms, the researcher identifies another great interest in the constructivistic perspective of game design for young children. Designing games requires a multidisciplinary approach, where various competencies are applied. The aim of this paper is to investigate the impact of organizing, implementing and facilitating learning environments that aim at increasing young students' game design competencies. In order to achieve this, the researchers proposed a teaching approach based on re-designing existing game concepts. Through a pilot of study where a particular game concept was introduced, the researchers observed, recorded and analyzed students' reactions, work process and strategies in order to provide empirical evidence that will help the academic community to have a better understanding of this area. (Abstract)

Kapuire, G.K., Winshiers-Theophilus, H., & Blake, E. (2015). An insider perspective on community gains: A subjective account of a Namibian rural communities' perception of a long-term participatory design project, *International Journal of Human-Computer Studies*, 74, 124-143.

Keywords: participatory design; rural community; user gains; user involvement

Community-based co-design takes place within a communal value system and opens up a new debate around the principles of participation and its benefits within HCI4D and ICTD projects. This study contributes to a current gap of expression of participants' gains, especially from an indigenous and marginalized rural communities' perspective. We have collected community viewpoints concurrently over the past five years of our longitudinal research project in rural Namibia. A number of themes have emerged out of the data as extracted by our native researcher, such as the special importance of learning technology, appreciation of the common project goal, the intrinsic pleasure of participation, frustrations about exclusions and other concerns, as well as immediate rewards and expectations of gaining resources. We acknowledge our own bias in the curation of viewpoints, and incompleteness of subjectivities while embedding our discussion within a local contextual interpretation. Through our learning from the communities we argue for a shift in perspective that acknowledges local epistemologies in HCI and participatory design and research. We suggest considering harmony and humanness as the primary values guiding community-based interactions. We discuss several challenges in the collaboration and co-creation of new knowledge at the frontier of multiple cultural, linguist, research and design paradigms. In the absence of generalized guidelines we suggest to pursue local workability while producing trans-contextual credibility. (Abstract)

Kayali, F., Sibernagl, M., Peters, K., Mateus-Berr, R., Reithofer, A., Martinek, D. … Hlavacas, H. (2016). Design considerations for a serious game for children after hematopoietic stem cell transplantation, *Entertainment Computing, 15,* 57-73.

Keywords: serious games; games for health; game design; children; cancer

Children who are treated with hematopoietic stem cell transplantation (HSCT) are hospitalized for many weeks or even months. Discharge to home is important but sufficient home care is essential. Beside regular physical and laboratory checks in the outpatient clinic, information on the daily health status is mandatory for early detection of possible life threatening complication. The conventional practice is writing reports into a paper diary. This approach became unattractive for many computer-oriented children and often the compliance decreased over the long recovery time (more than 2 years). Thus we designed a game-based system to track medical data of these children.

We present the results of a three-stage method where we compare the data from sick children with data from healthy children. We describe an explorative design approach and evaluate gaming preferences through a survey and an art-based drawing approach. The results show a preference of animal and fantasy characters and a majority of children illustrate a nature environment in their drawings. The most appealing game elements are “exploration”, “adventure”, “fighting” and “action”, partly with gender differences. We further reflect on the chosen array of design research methods and the use of proxies for sick children. (Abstract)

Khaled, R., & Vasalou, A. (2014). Bridging serious games and participatory design. *International Journal of Child-Computer Interaction*, 2(2), 93 - 100. DOI: 10.1016/j.ijcci.2014.03.001

Keywords: participatory design; serious games; children; procedural literacy; conflict resolution education

Participatory design (PD) has become widely popular within the interaction design community, but to date has had little influence within serious game design processes. We argue that serious game design complicates the notion of involving users as co-designers, as serious game designers must be fluent with both domain content and game design. In this paper, we share our experiences of using PD during the design process of a serious game. We present observations stemming from attempts to apply the existing PD methods of brainstorming and storyboarding. Reflecting on the shortcomings of these methods, we go on to propose a novel PD method that leverages two fundamental qualities of serious games–domain expertise and procedurality–to scaffold players’ existing knowledge and make co-design of serious games an attainable goal. (Abstract)

Kim, M. G., Oosterling, I., Lourens, T., Staal, W., Buitelaar, J., Glennon, J., ... & Barakova, E. (2014, October). Designing robot-assisted Pivotal Response Training in game activity for children with autism. In *Systems, Man and Cybernetics (SMC), 2014 IEEE International Conference on* (pp. 1101 – 1106). IEEE. DOI: 10.1109/SMC.2014.6974061

Keywords: No keywords

Robot assisted therapy for patients with autism is promising, but there is a need for well designed studies that combine expert knowledge from the field of robotics and autism. Here, an iterative, participatory design process of robot assisted Pivotal Response Training (PRT) for autism therapy is presented. The scenarios for the robot assisted PRT intervention were created using a scenario based design approach through intensive collaboration between robot engineer and therapist. The developed scenarios were then represented in a hierarchical model using Activity Theory. Based on that model, the PRT intervention was implemented by the end-user programming software and evaluated with a child with autism. The scenario based design and the use of Activity Theory

framework considerably speeded up the scenario creation process and the redesign time needed between the pilots compared to our previous experiments. (Abstract)

Kwon, S., Oh, S., Park, K., Kim, S. Y., & So, H. J. (2015, August). Children as Participatory Designers of a New Type of Mobile Social Learning Application. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct* (pp. 862 – 869). ACM. DOI: 10.1145/2786567.2793712

Keywords: game scenario design; layered elaboration; participatory design; pre-activity; serious game

In recent years, Participatory Design (PD) has emerged as an important design methodology to engage end users in various phases of design processes, for better understanding about users' perspectives in situated contexts. In this paper, we discuss how to design and structure a participatory design workshop with children, especially in the situation to elicit ideas, knowledge, and values for user experiences that children are not familiar with or have little prior experiences. Our approach to structure a PD workshop is to embed a pre-activity where children can have simulated experiences in a situated context. In a main-activity, children engaged in creating game scenarios with gamification strategies through the layered elaboration technique. In the discussion, we highlight two tensions observed in the PD process: (a) the tension in coupling pre-activity and main-activity from scaffolding perspectives, and (b) the tension in idea ownership and time factor. (Abstract)

Landry, P., Parés, N., Minsky, J., & Parés, R. (2012, June). Participatory design for exertion interfaces for children. In *Proceedings of the 11th International Conference on Interaction Design and Children* (pp. 256 – 259). ACM. DOI: 10.1145/2307096.2307139

Keywords: children; exertion interfaces; full-body interaction; interaction design; participatory design; physical activity; Wizard of Oz

We propose an adaptation of Participatory Design (PD) specifically conceived for full-body interaction design addressing the specificities that this entails. The idea is to include the preferences and points of view of children in the process of designing exergames allowing them to: (a) design activities that foster sufficient physical activity and a rich diversity of movement, (b) link this activity to the topic of the game and, (c) understand and test their designs at full-body scale already at prototype level. (Abstract)

Liu, L. S. (2014, November). Designing Communication Technologies for Children with a Chronic Illness. In *Proceedings of the 18th International Conference on Supporting Group Work* (pp. 258 – 260'0. ACM. DOI: 10.1145/2660398.2660434

Keywords: children; chronic illness; communication technologies; participatory design

Children with a chronic illness who must frequent the hospital for various treatments and procedures are removed from familiar environments, such as their home or school, to stay close to the hospital. Their temporary removal from familiarity can cause feelings of isolation. Social connectedness with their friends and classmates may help alleviate their feelings of isolation and help make them feel more "normal" like their healthy counterparts. However, current communication technologies are not designed specifically for chronically ill patients. By

understanding how patients use current technologies to stay connected with their friends, I propose to develop and carry out a participatory design methodology to produce technologies that assist the chronically ill paediatric population. (Abstract)

Malinverni, L., Mora-Guiard, J., Padillo, V., Valero, L., Hervás, A., & Pares, N. (2017). An inclusive design approach for developing video games for children with Autism Spectrum Disorder. *Computers in Human Behavior*, 71, 535 - 549. DOI: 10.1016/j.chb.2016.01.018

Keywords: autism spectrum disorder; design method; full–body interaction; game design; participatory design; social skills

The efficacy of therapeutic treatments for Autism Spectrum Disorder is mainly associated with the treatment's intensity in terms of weekly hours. This has led mental health professionals to explore the use of video games to complement traditional treatments. However, major weaknesses have been found due to poor game design, which has failed to fulfil therapeutic objectives or to properly engage children. These weaknesses are typically characterized by the poor integration of knowledge from mental health experts, children's interests and designers' expertise. Starting from this necessity, we propose an inclusive design approach to develop therapeutic games. The method presents strategies to integrate the expertise of clinicians, contributions of children and experience of designers through a set of elicitation and merging techniques. The goal of this method is to design games that are effective in terms of therapeutic objectives and that are enjoyable for children. To describe this method, we present its application in the design and development of a Kinect-based game for high-functioning children with ASD called “Pico's Adventures”. This game aims at promoting social initiation in young children with autism. Findings from a first exploratory study with 10 children with ASD showed the effectiveness of the game in eliciting social initiation behaviors. This provides a first validation of the method. An essential aspect of the game's success was the use of elements and mechanics that were appealing for the children. As a result, we have identified effective design concepts and paths for further research on games for children with ASD. (Abstract)

Marchetti, E. (2012, March). Micro Culture: Interactive storytelling and learning in the museum. In *Digital Game and Intelligent Toy Enhanced Learning (DIGITEL), 2012 IEEE Fourth International Conference on*, (pp. 84 – 88). IEEE. DOI: 10.1109/DIGITEL.2012.22

Keywords: digital technology; historical processes; museum; non-formal learning; participatory design; storytelling

This paper proposes a playful learning scenario, to enhance children’s museum experience, and the design of MicroCulture, a new learning platform. MicroCulture has been developed through a participatory design process, involving around 25 children. The perspective proposed in this paper is focused on enhancing existing storytelling practices, so to provide a more tangible grounding to the communication of historical processes and to elicit a lively dialogue between children and guides. In this perspective, it is proposed to turn storytelling, as a museum learning practice, into a more dialogic and playful mode of communication. (Abstract)

Mazzone, E., Read, J., & Beale, R. (2011). Towards a framework of co-design sessions with children. *Human-Computer Interaction–INTERACT 2011*, 632-635. DOI: 10.1007/978-3-642-23768-3_100

Keywords: children; co-design; framework; interaction design

In this poster, we present a framework of the elements of co-design sessions with children. The involvement of children in the design process is important in order to understand their needs but it is often considered a complex practice. Considering a thorough appreciation of this practice as the basis for its accurate application, we addressed its complexity in a framework. To do so, we identified and organised elements that have an impact on co-design sessions in who, where, when, what and how dimensions. This theoretical framework aims to support novice practitioners in their decisions when coordinating co-design sessions. (Abstract)

Medeiros, M. A., Branco, P., & Coutinho, C. (2012, June). Digitally augmenting the flannel board. In *Proceedings of the 11th International Conference on Interaction Design and Children* (pp. 212 – 215). ACM. DOI: 10.1145/2307096.2307128

Keywords: children; flannel board; participatory design; tangible interfaces

In this paper, we describe the design process of a flannel board augmented with audio and video recording capabilities. A participatory design methodology was followed by working with five-year-old children, over a six months period. The result was highly influenced by their brl722ehavior and spontaneous feedback. The resulting digital flannel board prototype supports the recording of the children's narration, the manipulation of figures and the playback of audio and projected "shadows". (Abstract)

Mora Guiard, J., Malinverni, L., & Pares, N. (2014, April). Narrative-based elicitation: orchestrating contributions from experts and children. In *Proceedings of the Extended Abstracts of the 32nd Annual ACM Conference on Human Factors in Computing Systems* (pp. 1159 – 1164). ACM. DOI: 10.1145/2559206.2581292

Keywords: methodology; requirement's elicitation; special needs

Integrating requirements from experts and children is a challenging task, especially when we design technology for children with special needs. This paper describes the use of the "narrative-based elicitation" as a method to facilitate the process of requirements' elicitation for the design of a Kinect game for children with Autistic Spectrum Disorder. The use of narrative resources to structure meetings with experts and participatory design with children allowed a smooth orchestration between different disciplines, generations and contributions. (Abstract)

Moser, C. (2013). Child-centered game development (CCGD): developing games with children at school. *Personal and Ubiquitous Computing*, 17(8), 1647-1661. DOI: 10.1007/s00779-012-0528-z

Keywords: child-computer interaction; educational pedagogy; game design; participatory design; user-centered design

Children represent an increasingly relevant target group of the game industry. Nevertheless, they are rarely involved in development processes. This article introduces child-centered game development (CCGD) approaches for the game design within the context of the school. Therefore, suitable HCI approaches from user-centered and participatory design as well as educational principles and approaches were used as a foundation. The CCGD approaches illustrate how to guide the involvement and participation of children aged 10-14 years in school classes within the development

process of games. Approaches for the analysis, conceptualization, and design phases were developed and applied. (Abstract)

Ndwe, T., Barnard, E., Dlodlo, M., Mashao, D., Kuun, C., & Sharma, A. (2008). Openphone user engagement and requirements solicitation in low literacy users. *Human-Computer Interaction Symposium*, 272, 189-193. Springer Boston. DOI: 10.1007/978-0-387-09678-0_17

Keywords: Botswana-Baylor children's clinical centre of excellence; OpenPhone; participatory design; usability engineering; user requirements

The OpenPhone project aims to design an Interactive Voice Response (IVR) health information system that enables people who are caregivers for HIV/AIDS infected children to access relevant information by using a telephone in their native language of Setswana in Botswana. The system lowers accessibility barriers since it is accessible to illiterate users and the community of the blind. The design utilizes usability engineering methodology in order to ascertain that the end product is usable, efficient, effective and satisfactory to the targeted users who are predominantly females, ranging from semi-literate to illiterate adults but nevertheless numerically literate. The paper describes the methodologies that were used to obtain information from the target user population. Based on the information gathered, we are now able to begin the initial design of the OpenPhone system. (Abstract)

Niemi, H., & Ovaska, S. (2007, June). Designing spoken instructions with preschool children. In *Proceedings of the 6th international conference on Interaction design and children* (pp. 133 – 136). ACM. DOI: 10.1145/1297277.1297304

Keywords: children; participatory design; spoken instructions

The participation of children in the technology design process is often enabled by drawing, low-tech prototyping, and collecting their experiences with hands-on trials as a basis for new designs. We report on a well-defined design task with six-year-old children as design partners, where no concrete prototyping methods were available. The children were able to contribute to the design of instructions. We found that children had little problems designing with speech when the goal was well defined. However, the children had problems in building up on the ideas presented by others. (Abstract)

Nunes, E. P., Luz, A. R., Lemos, E. M., Maciel, C., dos Anjos, A. M., Borges, L. C., & Nunes, C. (2016, October). Mobile serious game proposal for environmental awareness of children. In *Frontiers in Education Conference (FIE), 2016 IEEE* (pp. 1 - 8). IEEE. DOI: 10.1109/FIE.2016.7757353

Keywords: environmental awareness of children; environmentally sustainable; serious game; three-dimensional virtual learning environment

One of the many difficulties faced in cities include the accumulation of waste in streets, sidewalks, public squares, causing major environmental problems. This is not only due to lack of public policies and urban infrastructure, but also lack of citizen participation. Given this scenario, there is a crucial need to educate the people, especially children, who represent the future of society. This study presents a mobile serious game proposal, called "Protecting the Earth", about selective waste

collection, recycling, reduction of waste production and waste reuse in different game stages with focuses in childish public. The methodology adopted included Systematic Review; application of Participatory Design methods, such as the Context Inquiry technique; specification of functional and non-functional requirements and the study of technologies appropriate for developing the project. Experiments were conducted with children aiming to assess the proposed tool's interface. The results obtained by means of usability testing with users showed the need for adjustments in the interface in order to achieve greater accessibility and user satisfaction, and were met immediately. The next step is to perform learning evaluation experiments in order to verify if the proposed serious game is collaborating to acquire user knowledge about the study object (Environmental Education). (Abstract)

Nunes, E. P., Luz, A. R., Lemos, E. M., & Nunes, C. (2016, July). Approaches of Participatory Design in the design process of a serious game to assist in the learning of hospitalized children. *International Conference on Human-Computer Interaction*, 9733, 406 – 416. Springer International Publishing. DOI: 10.1007/978-3-319-39513-5_38

Keywords: hospitalized children; learning virtual environment; participatory design; serious games; three-dimensional

Although the literature shows initiatives of conception of serious game for the support learning of hospitalized children, generally, the design process stays on the draftsman responsibility, exclusively, being based on the initial requirements set-up. In this scenario, this article presents the design process of Three-Dimensional Virtual Environments (3D VEs), based on games, here considered as serious game, to assist in the learning of hospitalized children. The serious game is grounded in the Reference Model for conception of 3D Virtual Learning Environments (3D VLE) to assist hospitalized children [4] and counted on Participatory Design (PD) approaches. From the approaches of Contextual Inquiry (PD technique) with health professional, including the hospital class teacher, it was possible to identify the main needs and expectations related to the conception of a pedagogic, interactive and ludic tool that supports learning on children who stay long periods hospitalized. However, the serious game proposal can be extended to all the childish public interested in learning by means of serious games. In the next stage of PD process, we will apply the Mockups technique with the patient (children) using the prototype developed. (Abstract)

Nouwen, M., Schepers, S., Mouws, K., Slegers, K., Kosten, N., & Duysburgh, P. (2016). Designing an educational music game: What if children were calling the tune? *International Journal of Child-Computer Interaction*, 9, 20- 32. DOI: 10.1016/j.ijcci.2016.10.001

Keywords: games; music education; digital game based learning; participatory design; children's

This paper presents the design process of an educational digital music game that offers primary school children a first experience with music education. A four-phased Participatory Design (PD) trajectory was followed: exploratory interviews, Proxy Technology Assessment using the MemoLine instrument, co-design sessions and evaluation of the first demonstrator. This paper describes how PD principles can be used in obtaining design requirements for educational digital music games for children. The results highlight children’s desired game features for an educational music game. These include a clear feedback loop, a reward structure based on performance and persistence, chunking of learning content, an autonomous learning path, room for creativity and providing a ’private’ practice space while allowing public performance. (Abstract)

Parsons, S. (2015). Learning to work together: designing a multi-user virtual reality game for social collaboration and perspective-taking for children with autism. *International Journal of Child-Computer Interaction*, 6, 28 - 38. DOI: 10.1016/j.ijcci.2015.12.002

Keywords: virtual reality; collaboration; autism; communication; participatory design; intervention

Children with Autism Spectrum Disorders (ASD) find it difficult to engage in reciprocal, shared behaviours and technology could be particularly helpful in supporting children's motivations and skills in this area. Designing educational technologies for children with ASD requires the integration of a complex range of factors including pedagogical and cognitive theories; the affordances of the technology; and the real-world contexts of use. This paper illustrates how these factors informed the design of a novel collaborative virtual reality environment (CVE) for supporting communicative perspective-taking skills for high-functioning children with ASD. Findings from a small-scale study involving eight typically developing (TD) children (aged 8 years) and six children with ASD (verbal mental age 9 years) are also reported. Children with ASD were supported to be reciprocal and collaborative in their responses, suggesting that this CVE could form the basis for a useful technology-based educational intervention. (Abstract)

Parsons, S., & Cobb, S. (2014). Reflections on the role of the 'users': Challenges in a multi-disciplinary context of learner-centred design for children on the autism spectrum. *International Journal of Research & Method in Education*, 37(4), 421 - 441. DOI: 10.1080/1743727X.2014.890584

Keywords: autism spectrum disorders; HCI; learner-centred; participatory; social skills; technology design; user-centred; virtual reality

Technology design in the field of human-computer interaction has developed a continuum of participatory research methods, closely mirroring methodological approaches and epistemological discussions in other fields. This paper positions such approaches as examples of inclusive research (to varying degrees) within education, and illustrates the complexity of navigating and involving different user groups in the context of multi-disciplinary research projects. We illustrate this complexity with examples from our recent work, involving children on the autism spectrum and their teachers. Both groups were involved in learner-centred design processes to develop technologies to support social conversation and collaboration. We conceptualize this complexity as a triple-decker 'sandwich' representing Theory, Technologies and Thoughts and argue that all three layers need to be appropriately aligned for a good quality 'product' or outcome. However, the challenge lies in navigating and negotiating all three layers at the same time, including the views and experiences of the learners. We question the extent to which it may be possible to combine co-operative, empowering approaches to participatory design with an outcome-focused agenda that seeks to develop a robust learning technology for use in real classrooms. (Abstract)

Pihlainen, K., Montero, C. S., & Kärnä, E., (2017). Fostering parental co-development of technology for children with special needs informal learning activities. *International Journal of Child-Computer Interaction*, 11, 19-27. DOI: 10.1016/j.ijcci.2016.10.010

Keywords: parental partnership; technology co-development; children with special needs; children in the centre framework

Parental participation during children's free-time activities, schooling, and therapy is of core importance. However, parents' participation in long-term technology development is very rare, even though its importance has been widely noted. This paper looks at technology co-development with parents within informal learning club contexts for children with special needs. In this study, we describe how fostering technology co-design and co-development with parents contributes positively to the parents' participatory experience and involvement in the children's activities. The research was carried out by utilising the principles of participatory action research and participatory design. Our work highlights that providing an active role for parental co-development of technological activities fosters technology acceptance and family integration in long-term technology co-design, co-evaluation and co-intervention. This has strong implications towards social inclusiveness, technology demystification and innovative co-creation. (Abstract)

Pocuca, N., Hides, L., Zelenko, O., Quek, L-H., Stoyanov, S., Tulloch, K., … Kavanagh, D.J. (2016). Initial prototype testing of Ray's Night Out: A new mobile app targeting risky drinking in young people, *Computers in Human Behavior,* 54, 207-14.

Keywords: risky single occasion drinking; alcohol; binge drinking; mobile; application; young people

Background: Risky single occasion drinking (RSOD; ≥4 drinks in <6 h) more than doubles the risk of injury in young people (15–25 years). The potential role of smartphone apps in reducing RSOD in young people is yet to be explored.

Objective: To describe the initial prototype testing of 'Ray's Night Out', a new iPhone app targeting RSOD in young people.

Method: Quantitative and qualitative methods were used to evaluate the quality, perceived utility, and acceptability of the app among nine young people (19–23 years).

Results: Participants reported Ray's Night Out had good to excellent levels of functionality and visual appeal, acceptable to good levels of entertainment, interest and information, and acceptable levels of customization and interactivity. Young people thought the app had high levels of youth appeal, would prompt users to think about their alcohol use limits, but was unlikely to motivate a change in alcohol use in its current form. Qualitative data provided several suggestions for improving the app.

Conclusion: Following revision, Ray's Night Out could provide an effective intervention for RSOD in non help-seeking young people. A randomized controlled trial is currently underway to test the final prototype of the app. (Abstract)

Polyzou, E.A., Tamoutseli, K., & Sechidis, L. (2017). Children's evaluation of a computer-based technology used as a tool to communicate their ideas for the redevelopment of their schoolyard. *City, Culture and Society, 9*, 13-20.

Keywords: child; computer drawing; participation; schoolyard; Tux Paint

A surge of interest in empowering children's participation in shaping their environment has led to the development of many participation methodologies. There is, however, little evidence of research data utilizing ICT as a tool for generating children's ideas through a decision making process which results in changes to their schoolyards. This paper presents an evaluation of an adapted drawing program (Tux Paint) that is used as a research tool in a complex participatory method by gathering primary school children's perspectives on development of their schoolyard environment. These

changes were to be implemented through a collaborative project with the Department of Landscape Architecture of TEIEMT and the authority of Drama city, Greece. The participating children, ages 10–12, were asked to develop a vision for their schoolyard combining hand drawing plans and sketches utilizing the adapted Tux Paint software. They were the target focus group for the evaluation of the computer program and were asked to answer questionnaires regarding software efficacy, ease, and creative potential. Moreover, they were asked whether they simply enjoyed the experience of using the software and participated in interactive group sessions to discuss the degree of their satisfaction with their computer sketches. Chi-square or Fischer's exact tests were used to analyze the data. Gender and age were defined as variables influencing the evaluation. All the participating pupils valued the Tux Paint program as easy, quick, funny and an overall creative experience. (Abstract)

Read, J. C. (2009). Warp speed design: a rapid design method for use with children. *CHI'09 Extended Abstracts on Human Factors in Computing Systems*, 4681-4686. ACM. DOI: 10.1145/1520340.1520720

Keywords: children; participatory design; programming; tangible interfaces

This paper introduces a new design method - Warp Speed Design - for use with older children (aged 9+) for the design of workable tangible games. The rationale for the method is presented and then a workshop, in which the method was evaluated, is described. The method introduced children to basic programming concepts and worked surprisingly well. Almost all of the designs made by the children were so well specifies at the end of the brief workshop that they were able to be developed with very little uncertainty. (Abstract)

Read J.C. (2015) Working with Child Participants in Interaction Design. In Abascal J., Barbosa S., Fetter M., Gross T., Palanque P., Winckler M. (eds) *Human-Computer Interaction – INTERACT 2015. INTERACT 2015. Lecture Notes in Computer Science*, 9299, 655 -656. Springer, Cham. DOI: 10.1007/978-3-319-22723-8_87

Keywords: participatory design; teenagers; child computer interaction; evaluation; tutorial

This tutorial will introduce attendees to the challenges and benefits of working with child participants in interaction design and evaluation within the context of HCI. It will outline the most used methods and provide resources to participants so they will be able to carry out effective work with children from 4 to 16 in schools, homes and the outdoors. Delivered by an experienced member of the IFIP WP13.1 SIG in IDC, this tutorial will appeal to researchers and developers working with children and in the design of products for children. (Abstract)

Read, J. C., Fitton, D., & Horton, M. (2013). Theatre, playdoh and comic strips: designing organic user interfaces with young adolescent and teenage participants. *Interacting with Computers*, 25(2), 183-198. DOI: 10.14236/ewic/hci2014.17

Keywords: adolescents; children; design methods; energyuse; organic user interfaces; participatory design; teenagers

This paper presents the process and outputs from a participatory design activity with secondary school children whose task was to design organic user interfaces (OUIs) for use in energy-aware applications. Although experienced in participatory design sessions with children and teenagers, the

design team faced three new challenges in this work: how to convey the idea of OUIs, how to facilitate the pupils to design OUIs and how to interpret the OUI design ideas. To convey the ideas of OUI, the Obstructed Theatre method, used in other studies with children and teenagers, was used. In this work, the salient features of the OUI conveyed in the theatre were: its malleability, its potential to bend and change shape, its association with the body and its novelty. To facilitate the design, three scenarios of increasing user interface complexity were conveyed in the theatre; and three different media (i) slime and pipe cleaners, (ii) PlayDoh and small Lego bricks, (iii) fabric and sticky shapes that afforded the creation of designs representing future organic interactive technologies were deployed. To enable the design team to make sense of the resulting designs, a Comic Strip approach was used to capture the changes in the designs as they demonstrated interaction. The paper explores this work from three perspectives; first, the effectiveness of the Obstructed Theatre approach to convey requirements of OUIs, secondly, the effectiveness of the three media used in the design sessions to encourage design solutions for OUIs and thirdly, the quality and relevance of the design ideas generated in the sessions and communicated to the design team using the Comic Strips and their applicability to other contexts. The paper concludes with some thoughts on methods and materials that could be used to encourage design ideas for OUIs and offers some of the participants more innovative ideas for the research and development community. (Abstract)

Read, J. C., Fitton, D., & Horton, M. (2014, June). Giving ideas an equal chance: inclusion and representation in participatory design with children. In *Proceedings of the 2014 Conference on Interaction Design and Children* (pp. 105 – 114). ACM. DOI: 10.1145/2593968.2593986

Keywords: child computer interaction; ethics; participatory design

Participatory Design (PD) in various guises is a popular approach with the Interaction Design and Children (IDC) community. In studying it as a method very little work has considered the fundamentals of participation, namely how children choose to participate and how their ideas are included and represented. This paper highlights ethical concerns about PD with children within the context of information needed to consent. In helping children understand participation in PD, a central aspect is the necessity to help children understand how their design ideas are used which itself challenges researchers to seek a fair and equitable process that is describable and defensible. The TRAck (tracking, representing and acknowledging) Method, is described as an initial process that could meet this need. This is evaluated, in two forms, in a PD study with 84 children. The TRAck Method encouraged careful scrutiny of designs and allowed the researchers to distil useful design ideas although these were maybe not the most imaginative. There is a trade-off between the limitations of applying such a process to PD against the benefits of ensuring full informed involvement of children. (Abstract)

Read, J. C., Fitton, D., Sim, G. and Horton, M. (2016). How Ideas make it through to Designs: Process and Practice. In *Proceedings of the 9th Nordic Conference on Human-Computer Interaction (NordiCHI '16)* (pp. 1 – 10). ACM, New York, NY, USA. DOI: 10.1145/2971485.2971560

Keywords: ideation; design; ethics; participatory design; teenagers

This paper describes a process called RAId (Rapid Analysis of design Ideas), which assists, in the ethical and inclusive analysis of large sets of design data. It is described against an activity with 120 teenagers working in small groups contributing ideas for the design of an interactive water-drinking

bottle. Four investigators systematically examined fifty designs from the teenagers using six different lenses -- two concerned with the purpose of the designed technology (hydration and re-use), two with its desirability (aesthetics and cool) and two with the product concept (business and innovation). The investigators used these lenses to focus their examination. Each proposed a candidate solution based on what they had seen from the teen designs. The resulting concepts are examined against the teenagers' ideas that inspired them with attention being paid to when, and how often, ideas were put in mind. This analysis revealed three different idea types, core, add-ons and novel, each of which needed different treatment to bring it to fruition. (Abstract)

Robertson, J., & Balaam, M. (2013, June). Designing for the needs of child patients in hospital settings. In *Proceedings of the 12th International Conference on Interaction Design and Children* (pp. 625 – 627). ACM. DOI: 10.1145/2485760.2485890

Keywords: children; HCI; hospital; user-centred design

This position paper reflects on a series of user centred design methods used with 8-14 year old patients in a children's hospital, with the aim of evaluating the strengths and weaknesses of these methods within this unusual context. We conclude that there are significant challenges inherent in this type of work and question the appropriateness of participatory design and its methods for this user group. (Abstract)

Roussou, M., Kavalieratou, E., & Doulgeridis, M. (2007, June). Children designers in the museum: applying participatory design for the development of an art education program. In *Proceedings of the 6th International Conference on Interaction Design and Children* (pp. 77 – 80). ACM. DOI: 10.1145/1297277.1297292

Keywords: art conservation; children designers; informal education; museums; participatory design

In this paper, we describe the application of a participatory design methodology with children, developed within the context of an informal educational institution, specifically the National Gallery of Art in Athens, Greece. A group of 11 year-olds spent part of their summer learning about art conservation in order to design an on-line art education program targeted to children of their age. This paper presents the research, design, and prototype development process, and discusses the lessons-learned, challenges, and future possibilities of this methodology with respect to the design of museum education programs and exhibitions. (Abstract)

Ruland, C. M., Starren, J., & Vatne, T. M. (2008). Participatory design with children in the development of a support system for patient-centered care in paediatric oncology. *Journal of Biomedical Informatics*, 41(4), 624 - 635. DOI: 10.1016/j.jbi.2007.10.004

Keywords: participatory design; user-computer interface; decision support; children; cancer

Developing software for children with severe illness poses a number of design challenges. In this paper we describe participatory design methods used in the development of SISOM, a support system for children with cancer age 7–12 to help children elicit and report their symptoms/problems in a child-friendly, age-adjusted manner, and to assist clinicians at the point of care in addressing and integrating children’s reported symptoms and problems in patient care. The particular design challenges in the development of a clinical support tool for seriously ill children are described, followed by the participatory design techniques we used to meet these challenges. Healthy children

and children with cancer participated actively in different stages of the design process. We describe how children contributed to the graphical design of the system's interface; selection of understandable, child-friendly terms used in the system; iconic and graphical representations; and its usability. The methods applied helped us to significantly improve and adapt SISOM to children's cognitive and emotional developmental stage. Working with children as partners in the design also provided important insights into the role children can play in participatory design that may be helpful for other system developers who wish to design support applications for ill children. Children had very creative design ideas that considerably improved the software. However, system development for seriously ill children also requires psychological and pedagogical insights and design and usability expertise. This limits the role children can play as full design partners. (Abstract)

Siek, K. A., LaMarche, J. S., & Maitland, J. (2009, November). Bridging the information gap: collaborative technology design with low-income at-risk families to engender healthy behaviors. In *Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7* (pp. 89 – 96). ACM. DOI: 10.1145/1738826.1738841

Keywords: community-based participatory design; design workshops; health behaviors; low-income caregivers; underserved; wellness informatics

The leading cause of death in the United States is cardiovascular disease. Formative studies have shown that technological interventions may help effect lifestyle changes, however there has been minimal research to ascertain appropriate interventions for at risk, low-income populations. We conducted two participatory-based design workshops with nine caregivers and thirteen children to help determine suitable interventions for an at-risk low socioeconomic population. The major themes that emerged from the workshop for caregivers were their need for assistive systems that would help with everything from parenting to budgeting time and resources. Researchers in human computer interaction would benefit from our findings by developing a holistic sense of barriers encountered by low-income families to improve their health. We conclude the paper with a discussion of design implications. (Abstract)

Sieving, R.E., Allen, M.L., Galvan, A., Rodriguez-Hager, R., Beckman, K., Castillo, M., … Svetaz, M.V. (2017). Encuentro: Feasibility, acceptability, and outcomes of a culturally tailored teen-parent health promotion program. *Health Promotion Practice*, 18(5), 751-762.

Keywords: Latino; minority health; child/adolescent health; health promotion; community-based participatory research; health research; sexual health

The growth of the Latino youth population, combined with the reality that many Latino adolescents live in environments characterized by social disparities, reveals a compelling need to address health inequalities affecting Latinos through effective health promotion programs designed by and for this population. This article presents findings from a pilot study of Encuentro, a health promotion program for young Latino teens and their parents. Developed by a community–university partnership, Encuentro aims to bolster internal assets, familial and cultural supports for young teens' positive development, and healthy sexual decision making and behaviors. Encuentro was pilot tested with 49 Latino families at 3 community sites in Minneapolis/St. Paul. Families were assigned to a program group or a control group. Pilot study findings confirm program feasibility and acceptability. Compared to the control group, program group youth reported substantially more involvement in

activities celebrating Latino culture, and greater communication with their parents about sexual health topics. Parents in the program group reported greater ethnic pride, engaging in more activities to share Latino values and traditions with their teens, greater communication with their teens about sexual health topics, and increased parental monitoring than did parents in the control group. Findings demonstrate the potential of the Encuentro program. (Abstract)

Siozos, P., Palaigeorgiou, G., Triantafyllakos, G., & Despotakis, T., (2009). Computer based testing using 'digital ink': Participatory design of a tablet PC based assessment application for secondary education. *Computers & Education,* 52(4), 811-819.

Keywords: human-computer interface; interactive learning environments; secondary education

In this paper, we identify key challenges faced by computer-based assessment (CBA) in secondary education and we put forward a framework of design considerations: design with the students and teachers, select the most appropriate media platform and plan an evolution rather than a revolution of prior practices. We present the CBA application 'MyTest' which was developed using the participatory methodology We!Design, with the collaboration of 31 students and teachers. The application is targeted for the Tablet PC platform, provides "digital ink" capabilities and supports both closed-type and open questions, facilitating the transfer of traditional assessment practices to CBA. Both students and teachers were excited about the design sessions, and they asserted that they would rely more on educational software designed using this approach. The comparison of the 'MyTest' application with an assessment application developed with the same participatory methodology and the involvement of 40 undergraduate students revealed dissimilar expectations and needs of high school and undergraduate students that are often disguised or misinterpreted. A pilot evaluation of the application in real learning conditions was conducted with 31 students using Tablet PCs and with 37 students using traditional PCs. Interestingly, the Tablet PC platform rendered the 'MyTest' application more useful and usable to the students, validating our claims. (Abstract)

Smith, R. C., Iversen, O. S., Hjermitslev, T., & Lynggaard, A. B. (2013, June). Towards an ecological inquiry in child-computer interaction. In *Proceedings of the 12th International Conference on Interaction Design and Children* (pp. 183 – 192). ACM. DOI: 10.1145/2485760.2485780

Keywords: cooperative inquiry; design methodology; ecological inquiry; participatory design; school environment; social technology

This paper introduces an Ecological Inquiry as a methodological approach for designing technology with children. The inquiry is based on the "ecological turn" in HCI, Ubiquitous Computing and Participatory Design that shift the emphasis of design from technological artefacts to entire use ecologies into which technologies are integrated. Our Ecological Inquiry extends Cooperative Inquiry in three directions: from understanding to emergence of social practices and meanings, from design of artefacts to hybrid environments, and from a focus on technology to appropriations through design and use. We exemplify our approach in a case study through which we designed social technologies for hybrid learning environments with children in two schools, and discuss how an Ecological Inquiry can inform existing approaches in CCI. (Abstract)

Smith, R. C., Iversen, O. S., & Hjorth, M. (2015). Design thinking for digital fabrication in education. *International Journal of Child-Computer Interaction*, 5, 20 - 28. DOI: 10.1016/j.ijcci.2015.10.002

Keywords: digital fabrication; design thinking; education; participatory design

In this paper, we argue that digital fabrication in education may benefit from design thinking, to foster a more profound understanding of digital fabrication processes among students. Two related studies of digital fabrication in education are presented in the paper. In an observational study we found that students (eleven to fifteen) lacked an understanding of the complexity of the digital fabrication process impeding on the potentials of digital fabrication in education. In a second explorative research through design study, we investigated how a focus on design thinking affected the students' performance in digital fabrication processes. Our findings indicate that design thinking can provide students with a general understanding of the creative and complex process through which artifacts and futures emerge in processes of digital fabrication. (Abstract)

Stålberg, A., Sandberg, A., Söderbäck, M., & Larsson, T. (2016). The child's perspective as a guiding principle: Young children as co-designers in the design of an interactive application meant to facilitate participation in healthcare situations. *Journal of Biomedical Informatics*, 61, 149-158. DOI: 10.1016/j.jbi.2016.03.024

Keywords: participatory design; children; child's perspective; application; participation; healthcare situation

During the last decade, interactive technology has entered mainstream society. Its many users also include children, even the youngest ones, who use the technology in different situations for both fun and learning. When designing technology for children, it is crucial to involve children in the process in order to arrive at an age-appropriate end product. In this study we describe the specific iterative process by which an interactive application was developed. This application is intended to facilitate young children's, three-to five years old, participation in healthcare situations. We also describe the specific contributions of the children, who tested the prototypes in a preschool, a primary health care clinic and an outpatient unit at a hospital, during the development process. The iterative phases enabled the children to be involved at different stages of the process and to evaluate modifications and improvements made after each prior iteration. The children contributed their own perspectives (the child's perspective) on the usability, content and graphic design of the application, substantially improving the software and resulting in an age-appropriate product. (Abstract)

Sylla, C. (2013, June). Designing a tangible interface for collaborative storytelling to access 'embodiment' and meaning making. In *Proceedings of the 12th International Conference on Interaction Design and Children* (pp. 651 – 654). ACM. DOI: 10.1145/2485760.2485881

Keywords: children; collaboration; digital manipulatives; embodiment; participatory design; storytelling; tangible interfaces

This paper describes research on designing a tangible system for collaborative storytelling, which addresses preschool children. The first part of the work focused on creating a tangible interface, for children aged four to five years, proposing to create a playful experimental space where children can collaboratively engage in creating their own multimedia narratives. Further research proposes to carry a long term study with a group of 25 five preschoolers interacting with the developed tangible system, trying to investigate how physical interaction and collaboration might influence and shape cognitive and social processes in real classroom settings. We describe the design process, as well as the final system, and report findings from a first preliminary study. (Abstract)

Tan, J. L., Goh, D. H. L., Ang, R. P., & Huan, V. S. (2013). Participatory evaluation of an educational game for social skills acquisition. *Computers & Education*, 64, 70 - 80. DOI: 10.1016/j.compedu.2013.01.006

Keywords: participatory design; heuristic evaluation; education games; instructional design

This paper reports a study conducted to formally evaluate a social problem-solving skills game during the start of the development to ensure that the desired game attributes were successfully embodied in the final game. Two methods, heuristic evaluation and participatory design, were adopted to assess whether the features of the game pose playability issues to the prospective young users and to translate the participants' contributions into game design directions. The participants play tested and evaluated the game based on the Pedagogical Playability Heuristics, which are different from existing heuristics developed for commercial games, as priority was placed on instructional design principles and the concept of playability. Using storyboarding, they built low-fidelity prototypes of the game. Suitable children's design and feedback on the games attributes that would bring about stimulation, connecting instructions to goals, appropriate challenge and influencing goal achievement were integrated into the game design. As a consequence of the study, steps were taken to improve the game as an interactive system to achieve the instructional goals and at the same time foster enjoyment among the users. (Abstract)

Vaajakallio, K., Lee, J. J., & Mattelmäki, T. (2009, June). It has to be a group work! Co-design with children. In *Proceedings of the 8th International Conference on Interaction Design and Children* (pp. 246 – 249). ACM. DOI: 10.1145/1551788.1551843

Keywords: children; co-design; design games; make tools

Design researchers are increasingly interested in techniques that support creative teams in various design processes. The methods developed for sharing knowledge and generating solutions are mostly focusing on adults. Creative collaboration with and among children have a specific set of challenges to be considered. In this paper, we describe two design experiments that were conducted with children aged 7 to 9, to explore the applications of co-design methods with children. In those experiments, we observed that children are capable of utilizing make tools but have challenges in group dynamics and reflecting everyday experiences into design ideas. (Abstract)

Valente, A., & Marchetti, E. (2012, March). Kill it or Grow it: Computer Game Design for Playful Math-Learning. In *Digital Game and Intelligent Toy Enhanced Learning (DIGITEL), 2012 IEEE Fourth International Conference on* (pp. 17 – 24). IEEE. DOI: 10.1109/DIGITEL.2012.11

Keywords: computer games; forms of play; playful learning; prime factorization

Creating playful games to support domain-specific learning is a complex task. This paper presents the design and development of Prime Slaughter, a computer game to play with abstract mathematical concepts, like factorization and primality. The target group is composed of primary and early secondary school students. Following the findings of a participatory design study about children interaction in museums, our game maps operational aspects of prime factorization onto a game play inspired by 2D action-adventure games, where primality and factorization are experienced in a visual and direct way. The museum study also suggests to support learning by multiple play styles and goal-directed activities. A new participatory design study is about to start, to validate and improve the latest prototype of the game. (Abstract)

Van Mechelen, M., Zaman, B., Laenen, A., & Abeele, V. V. (2015, June). Challenging group dynamics in participatory design with children: Lessons from social interdependence theory. In *Proceedings of the 14th International Conference on Interaction Design and Children* (pp. 219 – 228). ACM. DOI: 10.1145/2771839.2771862

Keywords: CCI; children; co-design; group dynamics; participatory design; social interdependence theory

In this paper we explore whether Social Interdependence Theory (SIT) is a useful theoretical framework to anticipate on challenging intragroup dynamics in co-design with children. According to SIT, there are five principles that mediate the effectiveness of cooperation: positive interdependence, individual accountability, promotive interaction patterns, social skills and group processing. First, we theoretically ground six challenging group dynamics encountered in a previous study. Next, we introduce SIT and describe how we applied each of the five mediating principles in a new case study in which 49 children aged 9 to 10 were involved in a series of co-design sessions. Afterwards, we present our findings and reflect upon the SIT inspired co-design procedure. Finally we touch upon topics for further research and we make a call for more research on SIT in the Child Computer Interaction (CCI) community. (Abstract)

Vaucelle, C., & Ishii, H. (2007). Interfacing video capture, editing and publication in a tangible environment. In Baranauskas C., Palanque P., Abascal J., Barbosa S.D.J. (eds) *Human-Computer Interaction – INTERACT 2007. INTERACT 2007. Lecture Notes in Computer Science*, 4663, 1 – 14. Springer, Berlin, Heidelberg. DOI: 10.1007/978-3-540-74800-7_1

Keywords: authorship; children; collaboration; digital media; learning; mobile technology; tangible user interface; video; video jockey

The paper presents a novel approach to collecting, editing and performing visual and sound clips in real time. The cumbersome process of capturing and editing becomes fluid in the improvisation of a story, and accessible as a way to create a final movie. It is shown how a graphical interface created for video production informs the design of a tangible environment that provides a spontaneous and collaborative approach to video creation, selection and sequencing. Iterative design process, participatory design sessions and workshop observations with 10-12 year old users from Sweden and Ireland are discussed. The limitations of interfacing video capture, editing and publication in a self-contained platform are addressed. (Abstract)

Véliz, S., Espinoza, V., Sauvalle, I., Arroyo, R., Pizarro, M., & Garolera, M. (2017). Towards a participative approach for adapting multimodal digital books for deaf and hard of hearing people. *International Journal of Child-Computer Interaction*, 11, 90 - 98. DOI: 10.1016/j.ijcci.2016.10.003

Keywords: D/HH children; digital books; technology; participatory design

Participatory designs for the development of technologies have advanced considerably to incorporate children in the process of design and development. However, significant challenges remain for developers, specially regarding levels of continuous involvement by children, communication aspects with young children and the incorporation of children from minorities. In the present article the results of a systematized experience for adapting three multimodal digital books for deaf and hard of hearing (D/HH) children are presented and discussed. Four phases and

corresponding methods are described. Level of involvement, impact of participation in development and relations between children and adults are presented and analyzed considering how participation changes depending on the phase, activities and project progress and constrains. Results are discussed using the concepts of epistemology, values of the research team, results and stakeholders. (Abstract)

Waddington, J., Linehan, C., Gerling, K., Hicks, K., & Hodgson, T. L. (2015, April). Participatory design of therapeutic video games for young people with neurological vision impairment. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 3533 – 3542). ACM. DOI: 10.1145/2702123.2702261

Keywords: games; rehabilitation; therapy; vision; young people

Neurological Vision Impairment (NVI) detrimentally impacts upon quality of life, as daily activities such as reading and crossing the road often become significantly impaired. Therapy strategies for NVI based on visual scanning of on-screen stimuli have recently been demonstrated as effective at improving functional vision. However, these strategies are repetitive, monotonous and unsuitable for use with children and young adults. This project explores the design of a game-based therapy programme that aims to support participant engagement and adherence. We first outline requirements for this software, before reporting on the iterative design process undertaken in collaboration with young people, therapists and teachers at a centre for vision impairment. Our work provides insights into the participatory design of games in collaboration with young people with special needs, and reflects upon the tension of balancing game challenge, therapy goals, and accessibility. Furthermore, it highlights the potential of games to empower special populations by providing a medium through which to communicate the subjective experience of specific impairments. (Abstract)

Wakil N., Dalsgaard P. (2013). A Scandinavian Approach to Designing with Children in a Developing Country - Exploring the Applicability of Participatory Methods. In Kotzé P., Marsden G., Lindgaard G., Wesson J., Winckler M. (eds) *Human-Computer Interaction – INTERACT 2013. INTERACT 2013. Lecture Notes in Computer Science*, 8117, 754 - 761. Springer, Berlin, Heidelberg. DOI: 10.1007/978-3-642-40483-2_53

Keywords: developing countries; future workshop; inspiration card workshop; interaction design; mock-ups; participatory design

Participatory Design (PD) offers a democratic approach to design by creating a platform for active end-user participation in the design process. Since its emergence, the field of PD has been shaped by the Scandinavian context, in which many early PD projects took place. In this paper we discuss the challenges that arise from employing participatory methods in a different socio-cultural setting with participants who have had comparatively limited exposure to digital technologies. We offer a comparative study of two PD projects carried out with school classes in Scandinavia and India. While the setup for the two projects was identical, they unfolded in very different ways. We present and discuss this study, which leads us to conclude that PD can be a useful approach in both settings, but that there is a distinct difference as to which methods bring about fruitful results. The most prominent difference is the ways in which abstract and manifest participatory methods led to different outcomes in the two settings. (Abstract)

Walsh, G. (2011, May). Distributed participatory design. *CHI'11 Extended Abstracts on Human Factors in Computing Systems*, 1061 - 1064. ACM. DOI: 10.1145/1979742.1979696

Keywords: children; co-design; cooperative; design; participatory

Children who are not co-located with system developers because of geographic location or time zone difference have ideas that are just as important and valid as children who are easily "available". This problem is the motivation for my thesis work. I propose to design, develop, and research a computer-mediated, geographically distributed, asynchronous tool to facilitate intergenerational participatory design. (Abstract)

Walsh, G., Druin, A., Guha, M. L., Bonsignore, E., Foss, E., Yip, J. C., ... & Joshi, A. (2012, June). DisCo: A co-design online tool for asynchronous distributed child and adult design partners. In *Proceedings of the 11th International Conference on Interaction Design and Children* (pp. 11 – 19). ACM. DOI: 10.1145/2307096.2307099

Keywords: children; co-design; cooperative design; design; participatory design

Face-to-face design with child and adult design partners is not always possible due to distant geographical locations or time differences. Yet we believe that the designs of children in areas not co-located with system builders, or who live in locations not easily accessed, are just as important and valid as children who are easily accessible especially when designing for a multinational audience. This paper reports on the prototype design process of DisCo, a computer-based design tool that enables intergenerational co-designers to collaborate online and asynchronously while being geographically distributed. DisCo contains tools that enable the designers to iterate, annotate, and communicate from within the tool. This tool was used to facilitate distributed co-design. We learned that children were less forgiving of their inability to draw on the computer than on paper, and they formed small, intergenerational design teams at their own locations when the technology did not work as they expected. (Abstract)

Walsh, G., Donahue, C., & Pease, Z. (2016, June). Inclusive Co-Design within a Three-Dimensional Game Environment. In *Proceedings of the 15th International Conference on Interaction Design and Children* (pp. 1 – 10). ACM. DOI: 10.1145/2930674.2930721

Keywords: children; design; Minecraft; participatory design

Co-design research with children is a field that continues to find new ground and expand as it explores new, and more effective ways to design. As children become more enveloped in a world of technology and video games, it follows to leverage these kinds of experiences for use in our design toolbox. In addition, continuing to explore how to include a larger global audience through distributed co-design can advance the design process. The study presented in this paper serves as a preliminary exploration of virtual sandbox game environments as a co-design tool. Utilizing a design inclusive research approach, we discuss what led us to explore this environment as a co-design tool, how it evolved over time, and our success in using it to include those who could not attend in-person sessions. (Abstract)

Walsh, G., & Foss, E. (2015, June). A case for intergenerational distributed co-design: The online kidsteam example. In *Proceedings of the 14th International Conference on Interaction Design and Children* (pp. 99 – 108). ACM. DOI: 10.1145/2771839.2771850

Keywords: children; co-design; design; distributed; environment; participatory design

As more children's technologies are designed to be used with a global audience, new tools need to be created to include more children's voices in the design process. However, working with those children who are geographically distributed as design partners is difficult because existing technologies either do not support distributed design, or are not child-friendly. Industries that produce items for children to consume have begun using traditionally academic co-design techniques in order to design new products and experiences for children. As these groups need to reach out to more diverse and global populations, they will begin using technologies that support distributed co-design. As child-computer interaction researchers, we have a duty to understand this concept and identify recommendations for others to use that incorporate the ideals of our field. In order to do this, this paper describes the design process of an online environment to support geographically distributed, intergenerational co-design. Within this environment, children can work together despite differences of time zones, geographic location, or availability. The online environment was deployed for eight weeks during the summer and was modified each week throughout that time to better support the participants. Based on the experiences of participants within the environment, we make suggestions for new technologies including user management tools, creative expression tools, and ad hoc team membership that encourage more voices in the design process. (Abstract)

Walsh, G., Foss, E., Yip, J., & Druin, A. (2013, April). FACIT PD: a framework for analysis and creation of intergenerational techniques for participatory design. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 2893 – 2902). ACM. DOI: 10.1145/2470654.2481400

Keywords: children; design; design methods; design techniques

In this paper, we present a framework that describes commonly used design techniques for Participatory Design with children. Although there are many currently used techniques for designing with children, researchers working in differing contexts and in a changing technological landscape find themselves facing difficult design situations. The FACIT PD framework presented in this paper can aid in choosing existing design techniques or in developing new techniques regardless of the stage in the design cycle, the technology being developed, or philosophical approach to design method. The framework consists of eight dimensions, concerning the design partners, the design goal, and the design technique. The partner dimensions are partner experience and need for accommodation. The design goal dimensions are design space and maturity of design. The technique dimensions include: cost, portability, technology and physical interaction. Three cases will be presented which describe new techniques developed using the framework and two cases will describe existing techniques. (Abstract)

Weiss, P. L., Gal, E., Zancanaro, M., Giusti, L., Cobb, S., Millen, L., ... & Eden, S. (2011, June). Usability of technology supported social competence training for children on the autism spectrum. In *Virtual Rehabilitation (ICVR), 2011 International Conference on* (pp. 1 – 8). IEEE. DOI: 10.1109/ICVR.2011.5971867

Keywords: Autism Spectrum Condition (ASC); cognitive-behavioral therapy (CBT); collaborative games; collaborative virtual environment (CVE); shared active surface (SAS); touch table

We present the results of two usability studies evaluating the use of collaborative technologies designed to facilitate children with Autism Spectrum Conditions (ASC) learning social competence skills through technology-delivered Cognitive-Behavioral Therapy (CBT). The first study examined a co-located games (Join-In Suite) run on a multi-user tabletop shared active surface (SAS). The second study collaborative virtual environment (CVE) designed to support understanding and practice of social conversation skills. Both prototypes were developed following a participatory design process that included focus groups of occupational therapists and teachers as well as children with ASC. Usability studies were then conducted where occupational therapists used the systems for social competence training during a single one hour session with pairs of children with high functioning ASC, aged 9-13 years. Outcome measures included two usability questionnaires, the Intrinsic Motivation Inventory and interviews with the children. Therapists' responses to the System Usability Scale were also recorded. Results for SAS and CVE prototypes showed great enjoyment of the games, preferences amongst them and proficient use of the technology. For both technologies, the collaborative nature of the activities appeared to be effective in leveraging the engaging power of computer games as well as capturing a level of ecological validity which is often not sufficiently present in computer games alone. (Abstract)

Ye, Z., Hernandez, H. A., Graham, T. C., Fehlings, D., Switzer, L., Hamza, M. A., & Schumann, I. (2012, October). Liberi and the racer bike: Exergaming technology for children with cerebral palsy. In *Proceedings of the 14th International ACM SIGACCESS Conference on Computers and Accessibility* (pp. 225 – 226). ACM. DOI: 10.1145/2384916.2384965

Keywords: cerebral palsy; children; exergames; exergaming station

Children with cerebral palsy CPoften have limited opportunities to engage in physical exercise and to interact with other children. We report on the design of a multiplayer exercise video game and a novel cycling-based exergaming station that allow children with CP to perform vigorous exercise while playing with other children. The game and the station were designed through an iterative and incremental participatory design process involving medical professionals, game designers, computer scientists, kinesiologists, physiotherapists, and eight children with CP. The station combines a physical platform allowing children with CP to provide pedalling input into a game, and a standard PC gamepad. With this station seven of eight children could play a cycling-based game effectively. The game is a virtual world featuring several mini-games, group play, and an in-game money-based reward system. Abilities and limitations associated with CP were considered when designing the game. The data collected during the design sessions shows that the games are fun, engaging and allow the children to reach exertion levels recommended by the American College of Sports Medicine. (Abstract)

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Keywords: children; co-design; cooperative inquiry; design roles

Cooperative Inquiry is a Participatory Design method that involves children (typically 7--11 years old) as full partners with adults in the design of technologies intended for use by children. For many years, child designers have worked together with adults in Cooperative Inquiry approaches.

However, in the past children have not typically initiated the design problems tackled by the intergenerational team, nor have they acted in leadership roles by conducting design sessions-- until now. In this paper, we detail three case studies of Cooperative Inquiry in which children led the process of design, from initial problem formulation through one iteration of design review and elaboration. We frame our analysis from three perspectives on the design process: behaviors exhibited by child leaders and their fellow co-designers; supports required for child leaders; and views expressed by child leaders and their co-design cohort about the sessions that they led. (Abstract)