WizeFloor

Move / Play / Educate

Theoretical Rationale

The Science behind WizeFloor

Version 1.0 – January 2015

ALEXANDRA INSTITUTE

WizeFloor

Move / Play / Educate

WizeFloor Rationale in a Learning Theoretical Perspective

By Kaj Grønbæk, Professor at Aarhus University

The WizeFloor interactive floor for learning is built from the Wisdom Well 7. The Wisdom Well concept has been well documented in various research venues [6,7,11]. Moreover, it has received the Red Dot Design award as Best of Best within the category of Educational Products.

The main asset of the WizeFloor is its focus on utilising the full faculty of children's body for learning not only physical exercise purposes but also for cognitive learning coupled to body movement.

The Role of the Body in Learning

Body movement is a central means of learning for children, but the body is not limited to being a basis for movement activities or an instrument to impact on the surrounding environment. Gardner [5] provides a theory of multiple intelligences emphasising that each individual child possesses a unique combination of relatively autonomous intelligences including a body-kinaesthetic intelligence. Traditional classroom teaching emphasises the development of logical intelligence and linguistic intelligence but excludes body-kinaesthetic learning to the gyms.

Body and movement stimulate the sensory system in general, which gives the individual experience and knowledge of her/his own identity as well as the physical and social outside world. This sense perception makes a basis for reflection and abstraction – and in this manner, body movement also relates to cognition. The role and significance of bodily movement in children's learning processes is crucial, especially in the pre-school age, not only concerning health and exercise questions, but also sensuality, aesthetic, social and personal learning. Children sense and learn through the body. Merleau-Ponty's phenomenology [18] of the body gives the body an essential significance in relation to the individual's recognition of her/himself and others.

ALEXANDRA INSTITUTE

According to Moser [21], educational research confirms that movement based playing can be relevant in developing social skills, and in this way social skills attached to body and movement may lead to improvement of speech. The WizeFloor sets a stage for this kind of activities, whether it is concrete sound/speech training according to a bottom-up method or a dialogue in ''free'' games according to a top-down method. The WizeFloor is a motivating place to train vocabulary through games.

WizeFloor Supports Body-Kinaesthetic Learning

Traditional computer games and learning-systems, running on PCs and laptops, only challenge limited parts of the human body - usually only eyes, ears, and the pointing finger. But Gardner's [5] theory of multiple intelligences implies a need for multiple learning styles [4] to provide optimal learning for a broader range of children.

The objective of WizeFloor is to support multiple types of IT-based learning experiences for pre-school and school children. The WizeFloor has been inspired from several sources, namely empirical research in school environments [9], literature studies within multiple intelligences and multiple learning styles [5], and movement-based interaction techniques [19]. Others have pointed to the fact that computer supported learning artefacts can stimulate learning through kinaesthetic interaction. In a use survey of the commercial Dance Dance Revolution[1], Höysniemi [8]points to the fact that playing the kinaesthetic interaction game has a positive effect on the social life and physical health of players, and improves endurance, muscle strength, and sense of rhythm by the users. A more thorough study of how bodies matter in interaction design is described in Klemmer et al. [12]. The empirical research in schools revealed challenges in moving IT-support for multiple learning styles beyond the pure audio/visual styles and take advantage of kinaesthetic learning styles.

[1] www.konami.com

These are exactly the forces of WizeFloor. WizeFloor supports three types of applications.

1. *Collaborative learning applications.* The children work together through direct communication and kinaesthetic interaction on the shared surface. The collaborative presence provides the social qualities of, e.g. traditional board and card games.

2. *Simulation applications*. The WizeFloor surface is ideal for simulating scenarios in a scale that immerses the kids beyond traditional computer displays. Learning about geometrics, physics, geography, and biology involves many examples of scenarios where there are learning potentials in simulations that may scale the content, simulating the users to be, e.g. nano particle size or stellar size.

3. *Knowledge sharing applications.* A central placement of the WizeFloor in a department square makes it ideal for creating awareness of activities among classes or for large scale interactive presentations of the children's own project work. The floor is a remarkable interface that draws attention to displayed information and encourage exploration.

The applications have been developed in a participatory design process [10] with Danish children and teachers as participants. We particularly used the 'Fictional Inquiry' technique, [10,9], which establishes a shared narrative design space between stakeholders in the design process; in this case among teachers, children and designers.

WizeFloor Supports Children's Creativity

In addition to supporting the kinaesthetic learning styles, WizeFloor stimulates creativity and productivity, which are important means of constructive learning theories as well as those of positive psychology [13,14,15]. The WizeFloor tools support children and teachers in creating their own content. An example from a geography session shows that a group of six graders got very engaged in the exercises and made 50 questions themselves to the Quiz application on geography to

battle with their fellow classmates. Their classmates were invited to a 'battle' on the WizeFloor; a battle of capitals and famous sights worldwide. This particular Quiz game was played with eight participants and the rest of the class were cheering or advising the participants in the geographical questions. The children also quickly created their own gameplay rules on top of the Quiz. One of the rules was that answers must be selected with a different body part in each round so both hands, feet, knees, heads was used.

Another example is where older children (5th grade) at the school created content for younger children (0th grade). This exercise forced the older children to reflect on how to create good questions but also answers. It can actually be quite hard to find a plausible wrong answer to a question. The older children then presented the game and helped the younger children playing it at the WizeFloor [24].

In general the children approach the WizeFloor in a playful and creative manner and finds way to ''hack'' the system. They use their limps but may also throw shoes or other objects to select answers in the Twister inspired application Stepstone. Another approach is to use ''round the table'' known in schools e.g. when playing table tennis. Here the players take turns playing a round and changes each time a point is scored [23].

Balloons

In Balloons, the body must be activated to burst balloons. Like in the real world, the balloons burst with a loud BANG when stepped upon, or it might be that they are just pushed away. It is possible to put a letter on the balloons, which can be used to form a word at the end of the game.

Floor Keyboard

The Floor Keyboard is a spelling application, where the letters can be layout in different keyboard layouts and stimulate spelling activities for small kids. Floor

Keyboard is a collaborative game for one or more players. The players can choose letters by standing on the keys when answering questions such as: ''Which animal is in the picture?''. It is possible to practice spelling in combination with audio and images. A version of the application is also made with numbers.

Memory – Memory (team)

The Memory game is a kinaesthetic version of concentration games [1], where people have to remember placements of cards on a surface and through turn taking try to find matching pairs. Involving full body activity in concentration games couples concentration to more social situations with audience and activity and fun responses, thus training concentration in different types of situations. Moreover, the Memory can go beyond just the visual modality and utilise also live audio and video, which should be coupled to e.g. a text on a card. In the Memory Application, up to four teams can practice combinations of images, audio and text. For example, a piece with the image of a horse must be matched with the sound of it. Another example could be that 6+5 should be matched with 11 or 22/2.

Pong

Pong is a classical tennis-like game, and it calls for kinaesthetic interaction in that the players may use their body movement to move the bat from side to side similar to real tennis or ping pong. This application is included as a casual game for children to learn the bodily interaction of WizeFloor as well as for leisure in school breaks. On WizeFloor it is played by two players – one on each side of the WizeFloor and the sideward movements of their feet are tracked. The system keeps track of the players' scores and the player who first scores ten points has won the game. This game can be started by the children during breaks and stimulate social physical activity. Evaluating the Pong application with pupils on the WizeFloor [7], it was discovered that the number of participants engaged in the game escalated dramatically. Children did play one against one, but oftentimes the number of participants was above six. At one occasion three pupils controlled the bat in each site simultaneously, at other

occasions turn taking was brought into the game on their own initiative in order to increase the number of active participants in the game.

Quiz – Quiz (multi)

Quiz is a floor game for four players inspired by Trivial Pursuit™. During the game, a series of questions are ''thrown at'' the individual players from the centre of the floor. Players then have a few seconds to jump to the one of the two spots with the possible answers. If a correct answer is selected, both the player and the team will score a point since there is both an individual and collaborative score. In this way, players can play both with and against each other. In most cases the children get very engaged and try to help each other's in answering, either through communication or by explicit jumping to the right answer – running the risk of missing one's own next question. Children sometimes team up two in each corner holding on to each other to make joint jumps to the answer spots. In this manner, kinaesthetic interaction has introduced engaging physical activity on top of a traditional sit down quest game.

Paper Lines

In Paper Lines, the aim is to spell a word by choosing the correct syllables in a certain order. For example, a picture of a coconut is chosen, and the players must work together on picking the syllables ''co'' + ''co'' + ''nut''.

Slides

Slides can be utilised to make presentations for the WizeFloor. For example, it is possible to upload a series of images and display them as a slideshow at the floor. Three tools control the presentation: ''Back'', ''Forward'' and ''Rotate''.

Stepstone

Stepstone is a Twister-inspired quiz game for up to four players. Twister was released in 1966 by Milton Bradley Company. Whereas Twister is an edutainment game, Stepstone combines collaborative solving of learning exercises with the entertaining and engaging aspects of kinaesthetic interaction. The aim is to cooperate on selecting the correct answers by placing hands and feet on the stones placed on the floor. Each question has multiple correct answers and exceeds the number of players, so the players need to be active and collaborate on getting a high score. During the game, a series of exercises are issued in speech and text, and the children must quickly use their hands and feet to combine a selection of several game elements to provide the correct solution. Stepstone functions as a framework in which different learning content can be implemented as required (e.g. the multiplication table, mapping language concepts to broader language concepts etc.), as well as the graphical environment can be varied (e.g. sea, rainforest, the city, the universe etc.). An example setting is a beach with four shores in the corners and in the middle a sea and stones for players to step on. Exercises require each player to select a combination of stones to provide a solution. The interaction in the Stepstone application depends solely on kinaesthetic interaction. A variant of Stepstone was developed for hearing impaired children [11], who receive their exercise auditorily through connected cochlear implants.

Theme Cards

Theme Cards is a collaborative game for multiple players. The aim is to steer a shared cursor, and by doing so, activate different images, text, audio and video files placed on the floor. These files can be placed on top of a background, such as a map.

References

1. Concentration game http://en.wikipedia.org/wiki/Concentration_(game)

2. Craft, Anna, Howard Gardner, and Guy Claxton, eds. *Creativity, wisdom, and Trusteeship: exploring the role of education*. Corwin-volume discounts, 2008.

3. Dourish, P. (2001) Where the Action Is. The Foundation of Embodied Interaction. MIT Press.

4. Dunn, R. and Dunn, K. 1993. Teaching secondary students through their individual learning styles: Practical approaches for grades 7-12. Allyn and Bacon.

5. Gardner, Howard (1993) Frames of Mind: The theory of multiple intelligences, 2nd edition, New York: Basic Books. In Britain by Fontana Press. 466 pages.

6. Grønbæk, K., Iversen, O.S., Kortbek, K.J., Nielsen, K.R., Aagaard, L. (2007): iGameFloor – a Platform for Co-Located Collaborative Games. In proceedings of the International Conference on Advances in Computer Entertainment 2007, 13.-15. June, Salzburg, Austria.

7. Grønbæk, K., Iversen, O.S., Kortbek, K.J., Nielsen, K.R., Aagaard, L. Interactive Floor Support for Kinaesthetic Interaction in Children Learning Environments (2007). In proceedings of INTERACT 2007, September 10-14, Rio de Janeiro, Brazil. Springer Verlag

8. Höysniemi, J. 2006. International survey on the Dance Dance Revolution game. ACM Computers in Entertainment.Vol. 4 no. 2, April 2006

9. Iversen, O.S. (2006): Participatory Design beyond Work Practices – Designing with Children, Ph.D. Thesis, Dept. of Computer Science, University of Aarhus

10. Iversen, O.S. & Brodersen, C. (2007): Bridging the Gap between users and children – A socio-cultural approach to designing with children in Springer's journal Cognition, Technology and Work for the special issue on Child-Computer Interaction: Methodological Research, Vol 9, no. 2, June 2007

11. Iversen, O.S., Kortbek, K.J., Nielsen, K.R., and Aagaard, L. (2007) Stepstone-An Interactive Floor Application for Hearing Impaired Children with a Cochlear Implant. In proc. of IDC07 6th International Conference on Interaction Design and Children June 6-8, 2007, Aalborg, Denmark.

12. Klemmer, S. R., Hartmann, B., and Takayama, L. 2006. How bodies matter: five themes for interaction design. In Proc. of the 6th ACM Conference on Designing interactive Systems (University Park, PA, USA, June 26 - 28, 2006). DIS '06. ACM Press, New York, NY, 140-149

13. Knoop, HANS HENRIK. "Education in 2025: how positive psychology can revitalize education." *Applied positive psychology: improving everyday life, health, schools, work, and society. New York, NY, US: Routledge/Taylor & Francis Group* (2011): 97-115.

14. Knoop, Hans Henrik. "Positive Education, or Just Education." *Research, Applications, and Interventions for Children and Adolescents*. Springer Netherlands, 2013. 199-210.

15. Knoop, Hans Henrik. "Wise creativity and creative wisdom." *A. Craft, H. Gardner, & G. Claxton, Creativity, Wisdom, and Trusteeship: Exploring the Role of Education* (2008): 119-132.

16. Lund, H. H., Klitbo, T., and Jessen, C. (2005) "Playware Technology for Physically Activating Play", Artificial life and Robotics Journal, Vol. 9.

17. McElliot, L., Dillon, M., Leydon, K., Richardson, B., Fernstrom, M., Paradiso, J.: ForSe FIElds – Force Fields for Interactive Environments. In Proc. of Ubiquitous Computing 2002: 4th Intl. Conference Göteborg Sweden pp. 168 – 175.

18. Merleau-Ponty M. (1945) Phenomenology of Perception translated by Colin Smith, (New York: Humanities Press, 1962)

19. Moen, J. (2006): KinAesthetic Movement Interaction: Designing for the Pleasure of Motion, dissertation from KTH, Numerical Analysis and Computer Science, Stokholm, Sweden

20. Moen, J. and Sandsjö, J. BodyBug - Design of KinAesthetic Interaction, in Digital Proceedings of NORDES In the Making, Copenhagen, Denmark, 2005.

21. Moser, T. "Bevægelse i sproget – sproget i bevægelse" (in Danish) http://kidlld.dk/temaer/krop/beveagelse/ PloneArticle_view

22. Udsen, Lars Erik & Jørgensen, Anker Helms (2005): The aesthetic turn: unraveling recent aesthetic approaches to human-computer interaction. In Digital Creativity, Vol 16, No. 4, 205-216.

23. Round the table table tennis https://www.yourschoolgames.com/uploads/file/Table_Tennis(3).pdf

24. Molbæk, Gitte Dirkov: Læring på det interaktive gulv Vidensbrønden (Learning on the Interactive Floor the Wisdom Well), 1. års masterprojekt, IKT i læreprocesser brug og betydning 2. semester, maj 2012.