

Interactive Design Technics & the Future of Learning for Kids

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1. Introduction

“People see children as a small, weak and less qualified version of adults. They always think that children lack knowledge and they don't know how to be socialized. Children's treatment was justified by prevailing economic, moral and religious forces based on adult requirements.”(16) Such these thoughts and description were quite common in every field related to children, including education. Lack paying attention to the positive side of children and their capability to gain knowledge from every possible source they can reach, or what can they do and become if they have the chance to get the chance to develop their own instinctual skills and believe in themselves. Many reports has pointed to the importance of involving families into learning activities to promote their child's skills outside school, as the main resource for knowledge and information. But with all increasing socio-economical issues and problems, the role of the family get conducted in children`s learning and development through activities at home, has been decreased. There are tries to find an alternative solution to support and encourage children to learn and develop his own skills better way. But most of it was more like software missing to consider the personality of the child and his unpredictable attitude. So this paper will try to explore both types of kids learning & playing on one side, and on the other one the different types of the current solution. Then discuss it`s capability to fulfill what child need actually.

ملخص البحث

مع إزدياد فرص الحصول علي التكنولوجيا وحقيقة توافرها للكثير من فئات المستخدمين، فأن المزيد والمزيد من العائلات أصبحت تستخدمها. ووفقا لدراسة تمت بواسطة منظمة "إعلام المنطق"، وهي منظمة مهتمة بمساعدة العائلات في استخدام التكنولوجيا بمزيد من الحكمة، فأن 75 % من الاطفال تحت سن الثامنة لديهم صلاحية الإستخدام للأجهزة اللوحية أو أجهزة الهواتف الخلوية، وهذه النسبة قد زادت بمعدل 25 % في أقل من عامان، وهي في إزدياد كل عام. وفي ذات الوقت، فأن الناس عادة ما ينظرون للاطفال ككائنات صغيرة ضعيفة وأقل كفاءة من الكبار. فهم يفكرون دائما ان الاطفال يفتقدون القدر الكافي من المعرفة، وكيفية التعامل مع المجتمع.

ومع تلك المشاكل المجتمعية والاقتصادية المتزايدة، فأن دور الاسرة في تعليم الاطفال وتطوير مهارتهم من خلال الانشطة المنزلية المعتادة إخذ في الإنكماش، بالشكل الذي ولد إحتياج حقيقي لحل بديل لدعم وتشجيع الاطفال علي التعلم وتطوير مهاراتهم بانفسهم بشكل أفضل. لكن معظم تلك الحلول تمحورت حول إستخدام برمجيات برجمائيه تفتقد القدرة علي موائمة شخصيه الطفل وميوله المتغيرة التي لا يمكن توقعها.

لذا، فأن هذه الورقة البحثية إنما تحاول وضع تصور مستقبلي لسبل تعلم الطفل وتشجيعه علي ذلك بوضع تصور لوحات تعليمية تفاعليه يمكنها توفير بيئة مناسبة للتعلم سواء علي مستوي المهارات أو المعرفة. وذلك إستنادا علي دراسات تحليليه جاده لما يحتاج الطفل وما يمتلك من مهارات وقدرات، وما يمارس من أنشطة، وكذلك العوامل المختلفه التي قد تؤثر في الموقف التعليمي.

كلمات استرشاديه: أنماط اللعب، أنماط التعلم، وحده التعليم التفاعلية

2. Children and play effect

It is important to realize that kid's ability to learn skills enhanced when he experience it in daily life (26). And of course, replication will help them perfect, refine, and expand their abilities. Daily routines are those activities that occur daily life. Some of these activities are the mealtime, bath time, playtime, and bedtime. Many skills can be integrated into any routine.

A lot of psychotherapists agree that playing let us know about the inner life of children and his changeable needs. Playing can let us know about how children feel. For example when we observe children playing with dolls we will learn about the child's relationship with the family. Other example is storytelling, it gives us the chance to know how children think about themselves and others. Which could be used to envision what type of activities and solution may help his to keep developing himself.

2.1 Playing types

According to the sociologist Mildred Parten Playing is an important part in learning. Children how involve in playing, they learn how to make friends, talk, how to deal with others. Obesity become very popular disease especially in children. A lot of children are overweight, this is because they don't do physical activities. These days children is only setting playing with their iPad, PlayStation and watching TV so they don't burn calories and they become over weight. A study done by sallies, Prochaska, & Taylor reviewing 108 physical studies, found consistent associations between physical activity and the characteristics. These activities could be divided into 4 main types, as following:

Solitary playing where children won't be interesting of what others around them playing in. this stage of playing is important because it teach children how to be independence. The child is focused on their solitary activity and expresses no interest in other's behavior or joining in the play of other children. Solitary play is more common in younger children (under three years). (27)

Parallel play occurs when children play with the same type of toys but each one will play separate from one another. Children will learn from each other by observing. It is the key for development of social maturity.

Associative stage a kid will prefer playing with other children than playing alone. A child will be more interested in playing with other children around them than the individual toys they play with (15). They will interact together, talking and playing without rules. This stage will developed many skills in the children for example, problem solving, and cooperation.

Cooperative play in this stage children will be interested in playing in a group and in group activities. There will be a group leader as well as a task and a goal to achieve.

3. Learning types

Learning style is defined as the way that information is processed. It focuses on strengths, and there is no right or wrong learning style (21). Children can experience this learning skills through their day which is related to the emotional and social well-being. There are types of

learning in preschool. There are plays that need cognitive processes to let the child think of what is experienced. For example, trial and error, manipulation, and repetition are important to motor, language, and cognitive skill development. Learning in the Intellectual domain encouraged for Curiosity insight, discovery and problem. The way that adult use language is another learning strategy for children. Adults can build language learning by repeating saying and adding more information to what the child said, add some words, and giving examples to prove his or her ideas. These categories of learning styles were identified by Dr. Neil Fleming in the late '80s, and represent The VARK model of learning styles (20).

On the other hand there are four types of learning. Firstly, auditory learners, these type of learners prefer listening than anything else.

Secondly, kinesthetic learners, they learn by touching things. They will learn quickly if they do things physically. Finally, visual learners, they like reading and visual things. Students have different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices (7).

3.1 Kids Learnings skills

Kids in today's educational system are not being readied well for tomorrow's reality. They have many skills should learn to increase self confidence, self-reliance and others. Such as:

Asking questions: The child has no background in anything, so he start Asking Questions for his parents to explore and become has an idea about the information he wanted we must answer every question he ask and give him the correct answer before he gets wrong answers from other people. That's the thing about kids (18).

Solving problems: “About children natural children are natural problem solvers, and early childhood settings where children interact with one another and participate in decision making” (6). We have to support the nature of children to help the child to analyze problems, give solutions Options and choose the best solution, so he can depend on himself in the future. Children will have more knowledge and experience as they get older.

Of course their knowledge and experience in problem solving well be better and will give them more choices when they grow up. According to DeLoache, Miller, & Pierroutasakos, Ellis & Siegler, there are two kinds of problem solving skills are 1- framing rules for joining data and making judgments; and 2- thinking formative changes in essential subjective capacities influencing memory and information.

Finding passion: The ability to empathize is part of the qualities of an effective leader. Successful entrepreneurs are trying to identify other people's opinions and feelings so they can earn more than their colleagues. Sympathy is not something you have or not, there are degrees of it can be developed and understood by children as well as adults.

And here is more advantages Passion is a source of interest and excitement and it's unique to each individual, but passion isn't a life sentence. It can shift and change as kids grow. And it can't be forced. Passion is the greatest gift of self-discovery (14).

Independence: Once they learn to be independent, they learn that they don't need a teacher, or a parent, to tell them what to do. They can manage themselves, and be free, and figure out

the direction they need to take on their own, and this will help them when they grow up to make the correct decision, and here some other advantages a steep rise in confidence level and self-esteem, an ability to solve problems those, occur in daily life, developing compassion and love for others, an ability to help others and when they are facing problem better self-image and enthusiasm (1).

Being happy on their own: If a child learns from an early age that he can be happy by himself, playing and reading and imagining, he has one of the most valuable skills there is. And this is depending on how much he was confident about himself.

Compassion: Kids need this to work well with others, to care for people other than ourselves, to be happy by making others happy. How to make others happier with small kindnesses, how that can make you happier in return. And it will effects them when raising to respect and treat those who are different from them with kindness (15).

Tolerance: Expose kid to people of all kinds, from different races to different sexuality to different mental conditions. Show them that not only is it OK to be different, but that differences should be celebrated, and that variety is what makes life so beautiful. It also brings to person who learns to be open to differences more opportunities in education, business, and many other aspects of life (12).

Dealing with change: This will be one of the most essential skills as our kids grow up, as the world is always changing and being able to accept the change, to deal with the change, to navigate the flow of change, will be a competitive advantage. Tips for Helping Children Cope with Change, give advanced warning, Keep as much the same as possible, Answer all their questions and Expect that some regression may happen, by accepting of grieving (23).

4. Interaction design & education

Due to the changes in modern communities and current increasing socioeconomic issues, the regular normal chances for the kid to get an active social life with colleagues, exchanging knowledge and developing both social and motor skills, has been decreased to the minimum in the most of the cases. What created a crucial need for Interaction design to get involved in education, but till now most of the interactive solutions for education purposes ceased in software programs, games, simple interactive toys & furniture (as shown in figure No.1).

Where the focus is mainly on using simple technics to attract the child to react to the system or toward certain action with no consideration for kid`s changeable daily attitude or motives to get involved in such activities.

On the other hand, according to the American National Association for the Education of Young Children (NAEYC) Preschoolers are naturally drawn to technology. But before they begin learning with technology, they will need to learn the basics with rational companion. And here appear the need to develop more complicated advanced systems/units to encourage and support children`s learning process, this what will be named in the following as Interactive Educational Unit (IEU).



(Figure 1): Samples for simple interactive toys & furniture

This IEU should be designed to detect & record child's interests & movements, creating engaging interfaces with logical and thought out behaviors and actions to be as an alternate companion for the child. Aiming to make learning process more effective & entertaining.

And as Successful interaction design uses technology and principles of good communication to create desired user experiences. In another words, the aim of IEU is to incorporate strength with the design, to adjust, change and perform longer and more effective for the customer.

But this is not everything, where the need to add the capability of moving around intelligently, and deal with different types of variables, leads the IEU to be more as a Robotic based unit. And this a good changing point, that studies in the field of robotics have reported that robotics have a potential impact on students' learning in different subject areas (Physics, Mathematics, Engineering, Informatics and more) and on personal development including cognitive, meta-cognitive and social skills, such as: research skills, creative thinking, decision making, problem solving (1). Robots can do jobs, physical activities, and do a lot of work for human although it might have some risk. Robots can be used as a protection and taking care of children while their parent out of home. Parents can observe and watch their children in home from office.

IEU can also help in teaching children with special needs. Children with autism exhibit social behaviors with robots that may be useful in generating potential therapies. Such social behaviors include imitation, eye gaze, and joint attention. It can show them how to play, how to interact with others. That when the child is touching, playing and communication with the IEU, his behavior will change.

University of Hertfordshire made a robot called Kasper, to help children suffering from autistic (autism). Kasper was made with simple features and looking because it's aim to look friendly to autism children, that why there is less features on kasper's face. It interacts with children, giving reactions, for example if the child pinch his nose, he will say oh this hurt. Prof. Dr. Kerstin Dautenhahn observed that children who play with Kasper may also have high chance to interact and play with their teachers and others.

Also children with physical disabilities, respond well to robots. In three schools in Austria, PlayROB (Figure 2) gives children with cerebral palsy and other severe disabilities the chance to play independently (1). *Robots can help children with special needs for example, Robot-assisted learning for young drivers (ROLY) helps children in powered wheelchairs learn how to use their devices to navigate (5).*

To make it easier, the researcher classify the conceptual kid`s Robots into (5) types according to its activity, as following:

Behavior Teacher: According to Movellan there is a robot called Roomba (Figure 2) that is helping children cleaning up their rooms, Movellan said ”The funny thing is that in order to run the Roomba they already have to tidy things up a bit. The end result is that their room is clean and organized (5).



(Figure 2- left): Roly is a Robot-assisted learning - (Figure 2- right): Roomba is a cleaning helper

Reading Companion: Zenbo robot is a mobility robot (Figure 3). Zenbo is reading with the child. It can help you in the kitchen and give you recipes. It is a life helper it can schedule the medications times and when to take it and remind you with that. It has camera to take photos and video calling. Zenbo can tell stories with video recording. It can give an alarmed to save lives for example if your grandfather fall down, zenbo will record the faking and send you an alarm to come to him. It can play you music. Zenbo can interact with children and grown-ups. It is like member of the family. Zenbp can make your life easier.

Organizing Companion: Tapia is a talking robot companion. It has schedule alarm that you can schedule the time to wake up or for important tasks or meetings. It has temperatures sensors. It has Wi-Fi that can send an order to the coffee machine to do your coffee while you are preparing to go to work. Tapia also can make your life easier and make your online orders. It has sensors that analyze the movement and voice of the person and for example open a music that will be suitable and in the mood of the person in front of tapia. It scheduled all the daily memorization for example it will tell you when is the last time you called your father and if you want to call him tapia will do the job and make the call. But tapia does not have the ability to move.

Playing Companion: Chip Robot Toy Dog is a trainable robot and an affective one (Figure). It uses sensor and it has a special accessories in order to interact and play with the user. Chip will also play fetch with the Smart Ball and bring it back to you. You can control chip by wearing a smart band that is connected to chip so he will know that you are his user and he will play with you. And as much as you play with him his personality will grow and be more interactive and will adapt. You can send him to his smart bed to recharge himself. Chip has a voice recognition technology so you can just say his name and tell him what to do. Chip is fully aware of his surrounding areas.

Family Robot: Aido robot is a robot with a Segway style (Figure 4). it is asocial family robot. It is a customizable robot so you can add what personality or function you want it to have. There is an app for aido that keeps you connected to it. Aido is a mobility robot, it balance itself on a ball. As Aido has multiple cameras, it will give you an eye to all the environment in home. To conclude, Aido has entertainment hub, personal assistant, voice activated, HD multimedia projector, and home automation.



(Figure 3): Chip is playing with a child



(Figure 4): Aido robot features

4. Discussion

Reviewing the current situation with all the available concepts and actual products that aim to teach or help child to learn a behavior or a skill, there is a need to design more effective robotic based unit to fulfill as many tasks as possible guarding the child and helping him to develop his knowledge and skills. Capable to get use of any suitable situation to teach the child related information or skill. In the same time, upgrading itself or get upgraded to match his growing experiences and needs. In the same time, it has to look and behave more like a machine or a product, not like any familiar shape (like animals or characters) to avoid any chance to have a psychological problem like autism, especially with younger ages. And to make it more clearly, (IEU) should fit many learning types and skills by using different playing & teaching techniques according to the age, gender and attitude. For example, get upgraded orderly:

Solitary playing mode which teaches children how to be independences.

Parallel play mode where children are playing alone but with the same toys (age 2 to 3).

Associative playing mode where it's not preferred to play alone (age 3 to 4). Target or task to be done will be given to children in a group.

Cooperative playing mode this stage occur in children between 4-6 years old, and so on.

Also, (IEU) should use the 3 different learning types. Because even the same child need different type of learning according to the activity, the attitude and so many other variables.

To make it more clear, in the following part the researcher with 3 of his students will try to suggest some conceptual designs for IEU according to different design directions.

The first one is (The Blue Nanny), second one is (Astro Boy) and finally (Rozonit). There are common main functions among the 3 IEUs, like:

- Communication with family.
- Guarding the child.
- Playing mate.
- Learning mate.
- Overall having a good fitting to be “A Day Life Companion”.

Blue Nanny is a conceptual IEU for children from 2-6 years old (Figure 5). Designed by Ghufra Al-Rahili, it's a multifunctional unit in a convertible shape, from abstracted turtle shape to study desk. It has been provided with touch screen and all technical devices to be more like automobile (education-fun) station. It can also take care for kids, by following him and interact with him. Recording everything with a camera connected to the parents to feel contentment if they're not in home. Blue Nanny supposed to has an interaction system to detect child mood & attitude (through face expressions detecting software in addition to activity rate & heart rhythm), this system works within a time line include all the expected activities with flexibility to fit child attitude.



(Figure 5): Blue Nanny is following the child & helping him studying.

Astro Boy also is a conceptual IEU looks like a Space ship (Figure 6). Designed by Raghad Balkhair. It has many features to fulfill child's educational needs, it is mainly for young schoolers. The unit support solitary playing. Also it acts like a personal safety vehicle unit, where he can ride it going school or anywhere else with total parent's control. The unit get locked on the child inside until he arrives to the targeted place, this unit could be conceder as personal guard, Astro Boy uses all the learning types like auditory learners by Listen and speak to the speaker, kinesthetic learners by the touch screen & omni projector, also IEU will detect his movement. Finally, visual learners, by reading from the screen.



(Figure 6): Child play with Astro Boy IEU

Finally, Rozonit is an IEU (Figure 7) for children from 6 – 12 years old. Designed by Razan Al-Afif. Rozonit is multifunctional unit that supports different advanced skills. Rozonit has screen and virtual keyboard to help children in developing the mathematics skills to solve problems on the screen or assignments. It also has 3D printer so kids can draw on the screen and then 3D print it to have physical object of what they draw. It has projector so kids can watch move. Rozonit has a camera to help moms have an eye in their houses while they are at work to see what their children are doing. I can be used as a protector for children, to go with them to schools, by riding it like a hover board. Rozonit can serve the child in many ways, one of them is that it can be used as seat and desk.



(Figure 7): Child play with Rozonit

Of course, the three conceptual designs never been tested to measure their usability or the accuracy of the three designer`s hypothesis. But it still a kind of envisioning for the future of learning for kids, built on serious studies about the child`s educational needs, types of his skills, capabilities, activities and the different factors that affect learning situation. For sure, there are so many technical details about the used devices to achieve efficient interaction in each design, but the researcher preferred not use it within the context for two reasons: The first is to avoid complexity of the technical details, the second reason is the ability to replace any of the suggested devices with different device according to the available technology, so it could a point of debate more than clarifying the core of the discussion.

5. Conclusion

From the previous discussion & design tries, the most specific & clear description for the suggested (IEU) as a futuristic design to improve child`s educational skills & environment, could be formed as following:

(IEU) is mainly a Robotic Based Unit (RBU) in a form of mobile workstation, supported with the suitable devices to interact with the child in different playing & educational moods. Flexible enough to vary from mood to mood according to the captured variables either on the child himself or in the context, to fit his momentum attitude & resulted need. Providing or supporting an enjoyable, complete & sustainable educational experience for the child, and in the same time, able to serve the child in several additional ways to be reliable guarding companion.

6. Recommendations

In the end, the researcher recommends fellow design researchers to:

- Respect child`s personality and way of thinking as rapidly developing aspect.
- Be more cautious about the psychological & sociological impact of design on the child`s health and behavior.
- Get involved in more researches about the different uses of interaction design enhancing child`s educational attitude.
- Develop a specific design approach or criteria for children to be up to date with the state of art in the field of interaction design.

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