

# **Games as Tools for Sustainability: The usage in education and in community outreach**

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## **Abstract**

**This paper focuses in the roll of games in education for sustainable development. It presents a theoretical framework and the experiences of using games in education among future professionals in engineering and among professionals in the field of sustainable development.**

**We firstly present the educational process of Vigotsky School as a theoretical framework that supports the use of games in education. As part of that twelve learning skills in which games have an important place to foster creativity are presented. The paper will highlight the importance of these games for sustainable development as a change process. Secondly, as part of course activities based on Kolb's experiential learning, three different types of games are described.**

**Thirdly two experiences will be discussed. First the course "Environmental Challenges" within the *Universidad Autonoma Metropolitana* at Mexico City. The course uses various games and 100-students comments about what they learned in this course are presented. Secondly experiences of 8 consultants that participated in the development of a game-book for sustainable development at the *Erasmus University in Rotterdam* the Netherlands. Based on these experiences the paper will analyze the differences in using games in university education and in outreach and professional training.**

Key words: Play, Vigotsky theory, games for sustainable development.

## **Introduction**

Formal and informal education requires reorienting both to foster community engagement and educate agents of change. The use of games for education has known little acceptance, even more in higher education institutions and in outreach arena among adults. However, the importance of games seems to reach importance in the realm of sustainable development where context is necessary for acquire knowledge through grasp the reality as a capacity building for the implementation of change.

### **1. Use of games in education. The Vigotsky School as a framework**

The old adage that children's play is imagination in action can be reversed: we can say that imagination in adolescents and schoolchildren is play without action. If this is true, then it is possible to play games with adults too. There has been a tendency to sharply distinguish adult games from children's games. However, from Vigotsky School standpoint the elements of games that favor learning in children are also at work with adults. There is a progression from child to adult, and the games used with adults must be adapted to the adult's interest in games.

If we follow Vigotsky (1967), he says that "play is such that the explanation for it must always be that it is the imaginary, illusory realization of unrealizable desires. Imagination is a new formation that is not present in the consciousness of the very young child, is totally absent in animals, and represents a specifically human form of conscious activity. Like all functions of consciousness, it originally arises from action."

The special feature of human perception is so-called reality perception. This is something for which there is no analogy in animal perception. Essentially it lies in the fact that we do not see the world simply in color and shape, but also as a world with sense and meaning. Thus, the structure of human perception could be expressed as the particular relationship of object and meaning that arises on the basis of speech. This means that all human perception is not made up of isolated perceptions, but of generalized perceptions.

In a very young child there is such an intimate fusion between word and object, and between meaning and what is seen, that a divergence between the meaning field and the visible field is impossible. The root of situational constraints on a young child lays in a fact of consciousness: the union of affect and perception.

In early childhood, perception is generally not an independent feature, but an initial feature of a motor-affective reaction, i.e., every perception is in this way a stimulus to activity. Since a situation is always communicated, psychologically through perception, and perception is not separated from affective and motor activity, it is understandable that with his consciousness so structured, the child cannot act otherwise than as constrained by the situation – or the field – in which he finds himself.

In play, things lose their motivating force. The child sees one thing but acts differently in relation to what he sees. Thus, a situation is reached in which the child begins to act independently of

what he sees. One can begin to appreciate that the freedom of action we adults and more mature children enjoy is not acquired in a flash, but has to go through a long process of development.

In game an imaginary situation is created. This is an attribute and has always been recognized. Besides, if play is really developed from unsatisfied desires, if ultimately it is the realization in play form of tendencies that cannot be realized at the moment, then elements of imaginary situations will involuntarily be included in the affective nature of play itself.

From the point of view of development, the fact of creating an imaginary situation can be regarded as a means of developing abstract thought. An imaginary situation is not a fortuitous fact in a child's life; the imaginary situation will always contain rules and every game with rules contains an imaginary situation. All games with imaginary situations are simultaneously games with rules, and vice versa. It is the first effect of the child's emancipation from situational constraints. In play the child is free. But this is an illusory freedom.

The first paradox of game is that the child operates with an alienated meaning in a real situation. The second is that in play he adopts the line of least resistance, i.e., he does what he feels like most because game is connected with pleasure. At the same time, he learns to follow the line of greatest resistance; for by subordinating themselves to rules, children renounce what they want, since subjection to rule and renunciation of spontaneous impulsive action constitute the path to maximum pleasure in play.

What passes unnoticed by the child in real life becomes a rule of behavior in play. If game, then, were structured in such a way that there were no imaginary situation, what would remain? The rules would remain. The child would begin to behave in this situation as the situation dictates.

Thus, the essential attribute of game is a rule that has become an affect. "An idea that has become an affect, a concept that has turned into a passion" – this ideal of Spinoza finds its prototype in play, which is the realm of spontaneity and freedom. To carry out the rule is a source of pleasure. The rule wins because it is the strongest impulse.

At the end of play development, rules emerge; and the more rigid they are, the greater the demands on the child's application, the greater the regulation of the child's activity, the more tense and acute play becomes. Simply running around without purpose or rules of play is a dull game that does not appeal to children.

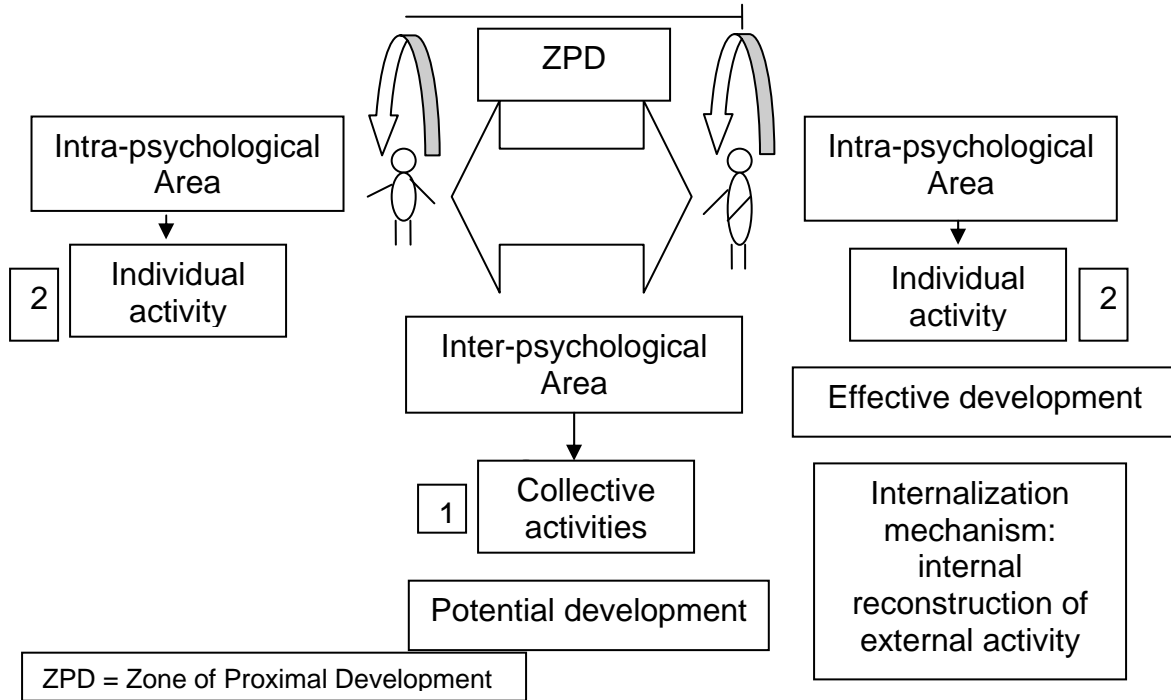
*An affect can be overcome only by a stronger affect*

**Spinoza**

In game, action is subordinated to meaning; but in real life, of course, action dominates over meaning.

In Figure 1 a schema of main principles of the Cultural Historical Activity Theory is shown. It has come down to us historically, that is, every psychological function has a history, a development that determines the level achieved in higher psychological process.

Figure 1: Scheme of how human psyche works according Cultural Historical Activity Theory, the Vigotsky School.



In the psyche of human beings, every higher psychological function exists at least two times, first in the social area as inter-psychological function, to appear later in the individual area as intra-psychological function. That is, higher psychological function comes out from interactions in the communication process between people.

Galperin and collaborators or Vigotsky School (Morenza, 2004) arises a hypothetical mechanism which explains the transit between both mentioned areas. This mechanism is called “internalization”. When we internalize our activity with external objects which are acting as socially defined symbols, we internalize not just an image of the symbol itself, but the whole structure of relationships and transformations which are built into the symbolic world. We use tools — words, symbols, rituals — as aids in this, but in “stage two”, we learn to do without the external tool. For instances, we find our way around a new city at first using a map, and afterwards, we do not need a map, we have an image of the city inside our heads.

Play is more nearly recollection than imagination – that is, it is more memory in action than a novel imaginary situation. As play develops, we see a movement toward the conscious realization of its purpose.

Game is converted to internal processes, going over to internal speech, logical memory, and abstract thought. Game is source of development. According Vigotsky (1985, Talyzina, 1988), development is created in the “zone of proximal development” (ZPD). The ZPD is the distances between social area and individual area, that is, between what the subjects can do unassisted and what they can do if prompted.

So, here Vigotsky sees the measure of development in what the subject can achieve in collaboration with other person. Vigotsky (1967) holds that *learning leads development*, that is, being presented with challenges and assisted in overcoming these challenges *induces* the development of new abilities. On the contrary, Piaget holds that *development leads learning*, that is, children can only learn what is possible for their given stage of development, which originates from an innate program of developmental stages.

Game permeates the attitude toward reality. It has its own inner continuation in school instruction and work (compulsory activity based on rules). All examinations of the essence of game have shown that in play a new relationship is created between the semantic and the visible – that is, between situations in thought and real situations.

## **2. Learning skills to foster creativity for sustainable development**

Nowadays, European universities have acknowledged directly or through strong agreements, like the Bologna Process (Bologna Declaration, 1999) or Dublin Descriptors (JQI, 2004), what higher education students must learn in a changing society. Skills go from searching information, in assimilation or retention of a great amount of it, administration of time and priorities, analyzing hypotheses in order to evaluate them and to make a decision, communicating to get cooperation or avoid disputes. However, very rarely it is for developing innovative skills or to be creative, or at least in a broader sense to lead students towards meta-cognition or grasp the reality.

Games can be those tools (or as Vigotsky says, concrete marks that first are an external aid and then are converted in structures in our mind) which can mediate between what students do without any kind of help to what they do by their relation with others. Using games then, we will help students to search new ways to work together in an unsustainable world where is not respected the natural and ecological boundaries and processes of the complex earth ecosystem and is required to develop very inventive skills. An unsustainable world requires collaboration, but also regarding to arouse the interest in developing:

- Inquisitive attitudes.
- Inductive reasoning.
- Generating of ideas.
- Organizing of new perspectives.
- Use of analogies.

Also to play games must:

- Avoid functional stiffness and other rigid forms.
- Take advantage of interesting or weird events.

- Transfer learned principles or strategies from one situation to another.
- Know task demand.
- Determine if goals are consistent with their capacities.
- Know means to get goals.
- Know own capacities and how compensate deficiencies.

These skills are still out of actual curricula of many universities around the world. However, games can develop innovative skills, as well as other ones mentioned above.

### 3. Experiences

In the next section of this paper we focus in particular on presenting two experiences about application of games in education, one for undergraduate engineering students in a Mexican university, and the other for consultants in sustainable development in the Netherlands. We present a list of game features that are sheared in both cases. Yet before we do that and roughly speaking, we mention three categories of games (Dieleman, 2004a, 2004b) can be distinguished: games for ‘self-analysis’, games for communication and ‘collaboration, and ‘system games’. Of course not all games have the same function. Some games help to discover parts of you; others help to understand processes and mechanisms in communication. Yet others help to experience the working of complex systems and help to position themselves within such systems.

- ***Games for ‘self analysis’***  
Games for ‘self analysis’ help the teachers and the learners to become more conscious of their processes of thought and their sensorial perception. The games help to experience parts of you. These can be for instance the implicit assumptions and values by which you approach other people, organizations or problems.
- ***Games for ‘communication and collaboration’***  
Games for ‘communication and collaboration’ help to understand and experience invisible mechanisms that take place when we communicate and collaborate. When hearing this, social scientists may be tempted to think of Karl Marx and his theory of materialism. According to Marx, we interpret the world according to the societal position we have: ‘being’ determines ‘consciousnesses and our vision of the world.
- ***System games***  
Systems games aim to show the players the functioning of complex systems. These games are extremely interesting in the context of sustainable development since sustainable development is a systemic concept. The games enable to see, feel and ‘experience’ various aspects of systems behavior. These experiences are very useful in the context of transformation of the world. While playing system games we feel we are part of a larger whole. We are able to influence the system, but we are usually not able to steer the system in exactly the direction we like it to move. This means that we have to try to unravel the functioning of a system. System games can help to understand the functioning of leverage points. Leverage points are crucial points in the system because by changing these points you can change the entire system.

These three kinds of games can play a role particularly all of the four stages of Kolb’s learning cycle (Dieleman, 2000, 2004b). In order to clarify that we look at the four stages again and image what educational program elements belong ideal typically to these four stages (See Figure 2).

In phase 1 we often work with case studies. The essential aim of stage 1 is to start to understand the role of actors, their problem definition and their ways to approach solutions. Phase 2 deals with tools and techniques and with understanding them in a partly comprehensive and partly apprehensive way. Games are especially helpful to apprehend the social and management aspects, tools and techniques. Phase 3 deals with scientific analysis and understanding theoretical insights. System games certainly can play a role in the clarification of the theoretical aspects of systems behavior. When scientists work in multi-disciplinary groups, as is almost always required in research in sustainable development, games for communication and collaboration can help to enhance the communication processes among researchers from different disciplinary backgrounds. Finally games are highly significant for phase four, the phase of active experimentation.

Figure 2: Educational program elements and games in different learning phases

Phases	Educational program elements	Games
1. Concrete experiences	Actors involved Actor perspectives Problems involved and the definitions of problems	Games for communication and collaboration System games
2. Reflective observation	Current practices in terms of solutions The use and understanding of tools The use and understanding of techniques	Games for communication and collaboration Games for self analysis
3. Abstract conceptualisation	Understanding theoretical insights Understanding limitations of used practices and techniques Learning new approaches and new contexts Working in (multi-disciplinary) teams	Games for communication and collaboration System games
4. Active experimentation	Applying knowledge and understanding in concrete and specific circumstances	Games for self analysis Games for communication and collaboration System games

### 3.1 Experience of Course “Environmental Challenges”

The course “The Environmental Challenges” (Juarez, 2004) started in the beginning of 2005 in the Basic Sciences and Engineering Division at the *Universidad Autónoma Metropolitana* at Mexico City and is now experiencing its second turn. The course is designed along the Experiential Learning Cycle of David Kolb (Juarez, 2005), and more specifically the way games have been applied to education in higher education institutions in engineering areas. That is why the different content elements and games of the course are presented in Figure 3 within the phases of the Experiential Learning Cycle.

Figure 3: Four games in the Course Analytical Program “Environmental Challenges”

<b>Weeks</b>	<b>Content and Games</b>	<b>Phase of Experiential Learning</b>
	<b><i>Actors, problems and perspectives</i></b>	<b><i>Concrete experiences</i></b>
1, class 1  1, class 2 2, class 3	Introduction to the course Team building Concrete experiences of actors (roll game) Definitions: environment (according Sauvé), pollution, pollutant, Mexican environmental legislation	Assimilative knowledge Adapt to existing contexts
	<b><i>Current practices</i></b>	<b><i>Reflexive observation</i></b>
2, class 4  3, class 5 3, class 6 4, class 7 4, class 8 5, class 9 5, class 10 6, class 11 6, class 12	Connection between problems and actor perspectives, and practices, tools and techniques Games for communication (paper tear) Biogeochemical cycles Water pollution control Water pollution control Air pollution control Air pollution control Soil pollution control Solid waste pollution control Hazardous waste pollution control Biodiversity	Accommodative knowledge Adapt to different contexts
	<b><i>New approaches and trends</i></b>	<b><i>Abstract conceptualization</i></b>
7, class 13  7, class 14 7, class 15 8, class 16	New concepts, approaches and connections with theories System games (avalanche) Global environmental situation Sustainable development and Earth Charter Approach of environmental pollution prevention	Convergent knowledge Change within contexts
	<b><i>Application of knowledge in specific circumstances</i></b>	<b><i>Active experimentation</i></b>
8, class 17 9, class 18 9, class 19 10, class 20 10, class 21 11, class 22	Pollution prevention in engineering activities Games for self analysis and collaboration (nine dots and electroplating simulation) Presentations by teams and industrial sectors Presentations by teams and industrial sectors Presentations by teams and industrial sectors Presentations by teams and industrial sectors Presentations by teams and industrial sectors Presentations by teams and industrial sectors	Divergent knowledge Changes contexts

In the phase of learning actor perspectives and within the context of presenting case studies, games like role-plays can serve a very significant role. Simulate hazardous wastes generation at a factory it is always useful for showing how emissions are rich in raw materials, and how companies first comply the law instead of looking for optimizing resources.

The game ‘paper tear’ shows for instance that the way we look at reality is literally depending on our position in reality. ‘Paper tear’ shows that this process is true in an even more literal sense. What we see as our left or our right depends on where we are, for instance in a classroom. This

has quit a few consequences for communication. By playing this game these consequences are immediately seen and 'felt' or experienced.

The game 'avalanche' shows us the complex interactions between individual intentions of participants of a system and the system behavior. Avalanche is one of the ultimate games to show the complexity of stabilizing and decreasing parameters such as for economic growth and consumption.

The 'nine dot' game for instance tell us a lot about ourselves but as much about how we look for solutions for a given problem. In our attempts to change the world it is equally important to be aware of our implicit functioning as well as the image we have of ourselves vis-à-vis the outside world.

Games and analytical program of the course "The environmental challenges" present a rather radical new approach, especially for a Division of Basic Sciences and Engineering. According to the participating students the new course is a success. At the end of the first round of teaching an evaluation showed very enthusiastic responses mainly in regard to "to be aware of global environmental problems and do reduce them for good of new generations" or "to suggest application of pollution prevention as a way to minimize wastes and make money in industrial sectors" or "to put in action what we see in theory". Even though or maybe because students are forced to see reality in an imaginary way in the class room, their evaluations were very promising. In short, games can serve very important roles in all program elements. Also, games should be an essential part of the curricula and should be a part of education for sustainable development.

### **3.2 Experience of Eight trainers / practitioners**

In 2003 and 2004 the Erasmus University developed a game book to work with games in the context of sustainable development. The project was part of the governmental program "Learning for Sustainability" that aimed to develop new tools and institutional arrangements to facilitate educators to change from environmental education towards education for sustainability. The project centered around the work on games of Dennis Meadows, such as the Systems Thinking Playbook. The project aimed to use a number of the games, translate them into the context of sustainability and train trainers/practitioners to work with the games in this context. The Erasmus University in the person of Hans Dieleman acted as a mediator between Dennis Meadows and the 8 practitioners. In a two-day workshop with Meadows and the practitioners the games were presented and played.

Meadows analyzed the usage of the games and discussed with the practitioners how to use them in concrete settings. The game book reflects the ideas of Meadows on the one hand and the ideas and experiences of the practitioners on the other hand. The practitioners came from various organizations such as the Global Action Plan, the Social Venture Network, municipalities involved in environmental education and institutes of higher education. Two groups of trainers/practitioners could be identified: those with and those without experience in using games.

The evaluation of this project took place on several moments: (1) at the end of the workshop, (2) six months later through observations, to see if practitioners started to use the games and (3) two years later using a questionnaire to see if practitioners still used the games. The questionnaire also asked whether the practitioners improved or changed the games and whether they started to use other games. The results give the following view.

After six months the practitioners experienced in working with games had incorporated a number of the new games in their training. In some cases the practitioners improved the games, especially to tailor them to specific situations such as the work with children. For instance, Meadows developed a variant of his famous Fishbank Ltd. computer game to use this game in groups without a computer. One of the practitioners, responsible for environmental education in primary schools, tailored this game through buying little plastic fishes and little plastic boats. In doing this the game fitted better to the world of children and they were more eager to play the game. In most cases the practitioners adopted the games as they were presented to them without modification. Hans Dieleman did a number of observations during training sessions of the practitioners to see how the games were used and receipted. The observation indicated that in some cases the execution of the games was rather poor. The practitioners used the games in a rather loose way. It showed that executing games is not easy and should be taken very serious (this was actually one of the lessons of Meadows during the workshop: “Playing games is a very serious issue”).

The practitioners experienced with games while entering the workshop were using the games after six months and were also using the games after 2 years. Those who used the games in a rather loose way adopted new games in the 2 years after having participated in the workshop. Those who decided to improve and tailor the games still used the same games.

The group of practitioners not experienced in using games indicated after 6 months that they had not started ‘yet’ with using the games, but that they intended to do so in the future. This situation did not really change after 2 years. The questionnaires indicate that they still don’t use the games, that they still are very positive about using games in general and that they hope they will be able to use the games in the future.

The experience coming from the side of the trainer/practitioner indicates the following. Using games in education and training is not easy. It is not enough to learn to know a number of games. It is above all important to practice and gain experience in using the games. Those trainers already experienced in using games could rather easily incorporate the new games in their practice. Some did this in a very serious way. Others used the games in a rather loose way. For the non-experienced, the two-day workshop could have been the start of a learning process, but apparently it was not.

One explanation is that using games is more than a cognitive process. Playing games with adults is not self-evident. Playing games in training adults mean to overcome potential skepticism among the trainees. It really means getting out of the comfortable world of normal adult communication. To do that takes a certain conviction and a certain brave. It impacts the trainer. When they do not feel sufficiently certain and experienced they may decide not to use games. This means that introducing games in education and training involves train-the-trainer sessions

that take sufficient time for trainers, not only to learn to play the games in a more analytical way, but to become comfortable in playing games in a more emotional way.

### **3.3 Using games in university education and in outreach and professional training**

Playing game is source of development.

- Playing games generate **learning experiences**. You can ‘learn by doing’ without creating real consequences for the outside world.
- Playing games offers the possibility to create **shared experiences or inter-psychological relations**. This is extremely important since this is the start to arrive at shared problem definitions and shared views of solutions. Especially in sustainable development this is a key issue. First of all sustainable development is a complex phenomenon that by its very nature involves various actors. Secondly it always involves actors of different backgrounds and different positions in reality. One of the key challenges is develop a shared view for such a heterogeneous group.
- Playing games contributes to **teambuilding**. Since playing games create shared experiences it can help to build teams. Not every shared experience leads to a more positive experience of the other. Shared experience and teambuilding are related but different issues. Playing games that facilitate communication and collaboration usually do result in better team performance and sense of belonging to a team. Here again the advantage of games is the ‘experimental’ nature of it. Since it is ‘not for real’ you may be able to seduce into experiences of collaboration that otherwise prefer to stay alone.
- Playing games contributes to **knowledge of oneself or intra-psychological relation**. By playing games participants gain insight in their own thought processes. It helps to discover the implicit assumption that you have in life, but that are not necessarily shared by others. Playing systems games helps to understand and feel people’s limitations and possibilities as part of a system. Participants learn that their freedom is bounded but that there is nevertheless room to move and to influence the system. This can be very helpful in real life when we want to realize some changes.
- Playing games helps to **test alternative solutions**. As mentioned before, the real beauty of playing games is that we can ‘learn by doing’ without negative consequences for the real world. We can simulate certain realities, play the games, manipulate reality and experience what the consequences are. At the same time while we are testing alternative solution we do at the same time learn things about ourselves and do create shared experiences as well. Especially for sustainable development it is essential to have these kinds of testing since due to the systems characteristics of sustainable development it is very difficult to predict the outcome of interventions in the real world
- Last but not least, playing games is **fun and entertainment or an idea that has become an affect**. Fun and entertainment is important because this generates energies and gives the

participants the passion to engage in the complex challenge that sustainable development confronts us with. It may also contribute to a change in the image that the concept of sustainable development still has. Many people associate the issue with words such as 'heavy', 'serious', 'negative' or 'depressing'. But in fact, even though there is some truth that some of the qualifications, sustainable development is at the same time a space for creativity and adventure. Playing games may help to make people see this part of sustainable development.

## Conclusions

It is difficult to play games among adults, because they are not comfortable in playing games among them. They feel that playing games at that age is not serious. So maybe using games is more than a cognitive process.

It is felt that games that are presented in this paper are potentially very useful, especially in the teaching/learning phase for undergraduate engineering students, because students were forced to see reality in an imaginary way in the classroom. So games are pedagogical tools to foster a process towards sustainability.

According Vigotsky School, Games can be tools or concrete marks that first are an external aid and then are converted in structures in our mind.

Playing games leads development either in social and individual areas, also is fun. Playing games is then an idea that becomes an affect. Because of that, playing games generate learning experiences for sustainability.

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## Bibliography

Bologna Declaration (19 June 1999):

<http://europa.eu.int/comm/education/policies/educ/bologna/bologna.pdf>

Corbeil, Pierre. (1999), "Learning From the Children: Practical and Theoretical Reflections on Playing and Learning". *Simulation & Gaming*, Vol. 30, No. 2, pp. 163-180.

Dieleman, Hans (2004a) *Playing for sustainability (Leren voor duurzaamheid, Dutch publication)*, Erasmus University, Rotterdam.

Dieleman, Hans and D. Huisinh. (2004b), "Games to learn Sustainable Development". *Proceedings of EMSU-2004, Monterrey, N.L., Mexico, June 2004.*

Dieleman, Hans (2000) Guidelines for a more effective training and education in environmental Management, EAEME, Varese, Italy.

Elkonin, D. B. (1997), “Esbozo de la obra científica de Lev Semionovich Vigotski”. *Revista Psicología*, No. 36, Septiembre-Octubre, pp. 2-20.

Ferreiro G., Ramón. (1997), “Lev Semionovich Vigotski: Mozart de la Psicología”. *Revista Psicología*, No. 36, Septiembre-Octubre, pp. 21-23.

González R., Fernando. (1997), “L. S. Vigotski: Presencia y continuidad de su pensamiento”. *Revista Psicología*, No. 36, Septiembre-Octubre, pp. 24-32.

Juárez-Nájera, Margarita; Turpin-Marion, Sylvie; González-Aragón, Abelardo; Espinosa-Valdemar, Rosa Ma.; Félix-Díaz, J. Ignacio; Cisneros-Ramos, Adriana. (2004), An Environmental Education Course Design for Engineers into Sustainable Development Frame in Mexico. Proceedings of the II Congress “Engineering Education in Sustainable Development”, Barcelona, Spain, October 27 – 29.

Juárez-Nájera, Margarita; Hans Dieleman and Sylvie Turpin-Marion. (2005), “An Environmental Awareness Course Design Based on Kolb’s Learning Experiential Model and Sauvé’s Typologies”. Proceedings of the 10<sup>th</sup> European Roundtable on Sustainable Consumption and Production, October 5-7, 2005. Antwerp, Belgium.

JQI. Draft 1.31 working document on JQI meeting in Dublin on 23/03/2004PC, Shared Dublin’ descriptors for the Bachelor’s, Master’s and Doctoral awards. [www.socwork.de/dublin.pdf](http://www.socwork.de/dublin.pdf).

Morenza Padilla, Liliana y Teresa Ruiz de Centurión (2004) Nuevas formas de enseñar y aprender. Guía para profesores. Universidad Autónoma Gabriel René Moreno e Instituto Internacional para la Educación Superior en América Latina y el Caribe, Bolivia.

Talyzina, Nina (1988) Psicología de la Educación, Ed. Progreso, Moscú.

UNESCO (1994), “Vigotsky”. *Revista Perspectiva*, vol. XXIV, nos 3-4, pp. 773-799.

Vigotsky, Lev. (1985). Pensamiento y lenguaje. Teoría del desarrollo cultural de las funciones psíquicas, Ediciones Quinto Sol, Moscú, (1934).

Vigotsky, Lev. (1967), “Play and its role in the mental development of the child”. *Soviet Psychology*, vol. 5, no.3, pp. 6 -18, (1933).