21ST CENTURY COMPETENCES: HOW TO DEVELOP THEM USING VIDEOGAMES IN A MULTIGRADE CONTEXT?

Competencias del siglo XXI: ¿Cómo desarrollarlas mediante el uso de videojuegos en un contexto multigrado?

Competências do século xxi: como desenvolvê-las através do uso de videogames em um contexto multigrau?

Yennis Cristina Lozano Abad
Educational Computing and Audiovisual Media graduate, Universidad de Cordoba. Technology and Computing teacher at El Cerrito educational institution in Monteria, Cordoba. Candidate of the Master's Degree in Education at SUE-Caribe, Universidad de Cordoba.

yennislo@hotmail.com

Angélica María Rosales Doria
Educational Computing and Audiovisual Media graduate, Universidad de Cordoba. Elementary teacher at Mariscal Sucre educational institution in the municipality of Buenavista, Cordoba. Candidate of the Master's Degree in Education at SUE-Caribe, Universidad de Cordoba.
angeemariarosalesdoria@hotmail.com

Juan Carlos Giraldo Cardozo
Mathematics and Computing graduate, Universidad del Quindio. Specialist in Audiovisual Language Pedagogy, Universidad El Bosque. Master's Degree in Systems and Computing Engineering, Universidad del Valle. Full-time professor of the Educational Computing School at the Education Department, Universidad de Cordoba and of the Master's Degree in Education at SUE-Caribe. Part of the Computing Research and Cognitive Computing group, lead of the Virtual Interactive Environments research incubator.
jgiraldo@correo.unicordoba.edu.co

en

es

por

ABSTRACT

The 21st century brings with it the need to develop skills that enable people to become effective workers and citizens, i.e. 21st century skills (Ananiadou, 2010; ATC21S, 2015). Video games as the first computer technology to which a large number of people had direct and personal access (Levis, 2013) are an attractive means to develop different skills, therefore could become an ideal resource to develop skills of the twenty-first century and enrich learning environments especially in multigrade training environments where the characteristics of students makes it necessary to implement innovative pedagogical proposals, active and participative, which leads to building an educational proposal based on experiences in pedagogical work that fosters the development of 21st century competencies from the use of video games, this seeking to generate initiatives to guide teachers in multigrade sites, creating an opportunity for them to identify how to develop competencies with strategies that can be viable and that have been tested in a real context and with an organized and planned process.

RESUMEN

El siglo XXI trae consigo la necesidad de desarrollar competencias que permitan a las personas convertirse en trabajadores y ciudadanos efectivos; es decir, competencias del siglo XXI (Ananiadou, 2010; ATC21S, 2015). Los videojuegos, como primera tecnología informática a la cual un gran número de personas tuvo un acceso directo y personal (Levis, 2013), resultan un medio atractivo para desarrollar diferentes habilidades, por lo tanto podrían convertirse en un recurso idóneo para desarrollar competencias del siglo XXI y enriquecer ambientes de aprendizaje, especialmente en entornos de formación multigrado, donde las características de los estudiantes hace necesario implementar propuestas pedagógicas innovadoras, activas y participativas, lo que conlleva a construir una propuesta educativa desde las experiencias en el quehacer pedagógico, que fomente el desarrollo de competencias del siglo XXI a partir del uso de videojuegos, esto buscando generar iniciativas que permitan guiar a los docentes de sedes multigrado, creando una oportunidad para que estos identifiquen cómo desarrollar competencias con estrategias que pueden

RESUMO

O século XXI traz consigo a necessidade de desenvolver competências que permitam às pessoas tornarem-se trabalhadores e cidadãos eficazes, ou seja, competências do século XXI (Ananiadou, 2010; ATC21S, 2015). Jogos de vídeo, como a primeira tecnologia de computador para a qual um grande número de pessoas tinha acesso directo e pessoal (Levis, 2013), são um meio atraente de desenvolver diferentes habilidades, e poderia, portanto, tornar-se um recurso ideal para desenvolver habilidades do século 21 e enriquecer os ambientes de aprendizagem, especialmente em ambientes de formação multigrau, onde as características dos alunos tornam necessário implementar propostas pedagógicas inovadoras, Ativo e participativo, que leva à construção de uma proposta educativa a partir de experiências de trabalho pedagógico, que promove o desenvolvimento de habilidades do século XXI a partir do uso de jogos de vídeo, este buscando gerar iniciativas para orientar os professores em locais multigrau, criando uma oportunidade para que eles possam identificar como desenvolver habilidades com estrátegias que podem ser viáveis e

ser viables y que hayan sido probadas en un contexto real y con un proceso organizado y planeado.

foram testados em um contexto real e com um processo organizado e planejado.

INTRODUCTION

The 21st century brings new trends, transformations and needs to develop competences to enable people to become effective workers, to be able to assume changes and adapt to different contexts, generate original and pertinent ideas, communicate in a way that is effective and efficient, use technologies as tools, set goals, overcome obstacles, interpret, analyze, infer, work with other people for a common goal and self-regulate their own learning process, all of the above are the 21st century competences (Ananiadou, 2010; ATC21S, 2015). Yet, it is the duty of education to contribute and to use the means to develop skills needed for students to face the challenges of this century (Ministry of National Education, Colombia, 2015; Law 115, 1994). Likewise, this period is framed within the Information and Communications Technology (ICT) entailing that its daily use permeates every sphere of the society, from interpersonal relationships through social media, to the use of apps to access different services such as shopping, browsing, accessing the labor market, entertainment and an array of procedures.

Videogames are the first computing technology to which people have had direct and personal access (Levis, 2013), proving it can be an attractive means to develop social skills, problem-solving skills, strategy planning, decision-making, information search, group collaboration, inductive discovery, logical reasoning, self-control, ICT competences among others (Gee, 2004; Ferrer, 2005; Gomez del Castillo, 2007; Morales, 2009), this attests that videogames could become a suitable resource to develop 21st century competences and enrich learning environments, especially for multigrade training, which requires implementing changes to the traditional teaching practices, managing classroom heterogeneity, introducing cooperative learning and developing flexible strategies (Colbert, 1999). It is important to add that a multigrade training environment is that in which students of one or more grades are grouped into the same classroom and are serviced by one single teacher; this educational modality is typical of rural areas (Bustos, 2010).

Nowadays it is common for children and teens to have access to electronic devices, both at home and at the educational institution they attend on a daily basis. However, in the multigrade locations of Villa Aidee, Veracruz, Campo Solo and El Paraiso, affiliated to the Mariscal Sucre educational institution in Buenavista, Cordoba, where the research "Collaborative Construction of a Methodology to use Videogames to Contribute to the Development of 21st Century Competences in a Multigrade Training Context (VICOM S-21)" was conducted, the use of these devices was occasional to non-existent and the teachers at this multigrade locations did not have a guide to implement or create strategies to properly use ICT and competence development.

Considering that it is necessary to train competent people for the current world and taking into account that videogames might be an option for competence development due to their inherent characteristics: playing with them gives children freedom to act; videogames have specific goals to reach using different mechanisms and resources; their narratives involve children in a complex story of real and imaginary social situations, and eve entice them to create them; children are allowed to experiment with different gaming options; adapt to each student's learning capacities; dynamize their group relationships and behavior; and make the player the center of experience, which requires concentration and focus (Eguia, 2012); plus the fact that the multigrade locations affiliated to the Mariscal Sucre educational institution have the necessary technological resources, led to a methodology that encourages the development of 21st century competences with videogames in a multigrade training context through pedagogical practice experiences, aimed at generating initiatives that allow guiding the teachers at the multigrade locations, creating an opportunity for them to identify how to develop competences with feasible strategies that have been proven in a

real context with an organized and planned process.

1. METHODOLOGICAL DESIGN

The research entitled "Collaborative Construction of a Methodology to use Videogames to Contribute to the Development of 21st Century Competences in a Multigrade Training Context (VICOM S-21)" included all of the students and teachers at the multigrade locations of the Mariscal Sucre educational institution in Buenavista, Cordoba (Villa Aidee, Veracruz, Campo Solo and El Paraiso). The type of study was action research, and the teachers reflected on their classroom practices, analyzed the pedagogical benefits of videogames (being used with an educational intention) and the need to develop 21st century competences in their students; from there, strategies were created to build a new educational proposal. Moreover, a validation of whether the introduction of the VICOM-S21 methodology in the students' academic routines helped develop said competences was conducted through observation and analysis. The study was based on the action research model by Kemmis, which encompasses four integrated stages: planning, action, observation and reflection, resulting in a knowledge and action self-reflective spiral. The reflection stage gives closure to each cycle and is the basis to draft a report and a possible reconsideration of the strategies to begin the next cycle (Latorre, 2007).

The research process lasted thirteen months, and it was done in three cycles, each with its own specific objective, as follows:

Table 1. *List of specific objectives – cycles of the research*

No.	NAME OF THE CYCLE	OBJECTIVE
1	**PROPOSAL OF ACTIONS AND STRATEGIES**	Proposing strategies and actions to incorporate the use of videogames in classrooms to boost 21st century competences in a multigrade training context
2	**FORMALIZATION AND APPLICATION**	Formalizing and applying a methodology based on the use of videogames to boost 21st century competences in a multigrade training context
3	**FEEDBACK**	Analyzing changes, advantages and limitations evinced in the application of the proposed methodology

Source: compiled by the authors (2018)

It must be mentioned that before the cycles begin, an idea or topic was established as grounds for the study: Which methodological orientations may derive from the use of videogames to develop 21st century competences from a pedagogical practice in a multigrade training context? In each cycle, four stages called **planning, action, observation** and **reflection** were implemented, as shown below.

Table 2. *Research process: proposal of actions and strategies*

Cycle 1: **PROPOSAL OF ACTIONS AND STRATEGIES**			
Stage	Actions	Research technique	Time
Planning	Choosing the participant population	Observation	45 days
	Literature review	Documentary management	
	Teacher coding	Documentary management	
	Questionnaire for the first approach	Instruments design	
Action	Activity 1: first approach	Semi-structured interview	30 days
	Activity 2: discussion	Focus group	
	Activity 3: stage closure meeting	Semi-structured interview	
Observation	Activity 1: first approach	Semi-structured interview	30 days
	Activity 2: discussion	Focus group	
	Activity 3: stage closure meeting	Semi-structured interview	
Reflection	Information analysis	Reflexive dialog	30 days
	Contrasting theories		
	Discussion of the coreserach group		
	VICOM S-21 methodology design		

Source: compiled by the authors (2018)

Table 3. *Research process: formalization and application*

Cycle 2: **FORMALIZATION AND APPLICATION**			
Stage	Actions	Research technique	Time
Planning	Selection of videogames	Selection based on convenience	15 days
	Chronogram to visit the locations	Focused strategic planning	
Action	Stage 1: VICOM S-21 setting	Focus group	5 days
	Stage 2: VICOM S-21	Structured interview	80 days

Panorama I

pp. 7-17 I

Volumen 12 I

Número 23 I

Julio - Diciembre I

2018 I

ISSN Impreso

1909-7433 I

ISSN en línea

2145-308X I

	implementation	Observation	
	Stage 3: VICOM S-21 assessment	Semi-structured interviews	8 days
Observation	Stage 1: VICOM S-21 setting	Focus group	5 days
	Stage 2: VICOM S-21 implementation	Observation	80 days
	Stage 3: VICOM S-21 assessment	Semi-structured interviews	8 days
Reflection	Information analysis	Reflexive dialog	30 days
	Contrasting theories		
	Discussion of the coreserach group		
	VICOM S-21 methodology reconsideration		

Source: compiled by the authors (2018)

Table 4. *Research process: feedback*

Cycle 3: **FEEDBACK**			
Stage	Actions	Research technique	Time
Planning	Literature review	Documentary management	10 days
	Design of activities to add to the VICOM S-21 methodology	Reflexive dialog	
Action	Adjustments to the VICOM S-21 methodology in the implementation stage	Reflexive dialog	4 days
	List of new videogames	Documentary management	2 days
Observation	Adjustments to the VICOM S-21 methodology in the implementation stage	Reflexive dialog	4 days
	List of new videogames	Reflexive dialog	2 days

Reflection	Information analysis	Reflexive dialog	10 days
	Contrasting theories		
	Discussion of the coreserach group		
	Design of the VICOM S-21 methodology version II		

Source: compiled by the authors (2018)

2. *Results*

Cycle 1: proposal of actions and strategies: three activities were conducted in this cycle: first, an approach between teachers and students to raise awareness on the project's accomplishments and on how they, as members of the Mariscal Sucre educational institution's multigrade locations could become an active part. Then, information was collected regarding didactic techniques and strategies used by teachers in their classes, inquiries were made on the skills considered necessary to perform well, and concepts and opinions were gathered on the use of ICT (videogames). A conversation was planned as a result of the existing gaps in teachers concerning 21st century competences and the need to enforce them in the classroom; each competence was identified as per ATCS21S project, which frames them in eleven skills and in four large categories: **ways of thinking** (creativity and innovation, critical thinking, problem-solving and learning to learn); **tools to work** (appropriation of digital technologies and information handling); ways of working (communication and collaboration); and **ways of living in the world** (life and career, personal and social responsibility, and local and global citizenship). Lastly, the teachers and researchers met again to discuss the strategies that could be planned and developed in connection with the use of videogames aimed at developing 21st century competences in the students at the multigrade locations.

Upon analyzing the information collected in each activity and contrasting several authors' theories about the topic that is the object of this study, a methodological proposal

including the contributions of the researcher teachers was produced. It is important to explain that this proposal was socialized with the participating teachers; some adjustments were made after a discussion, after which they gave its approval and named it VICOM-S21 methodology.

Cycle 2: formalization and application: after showing and debating a selection of videogames with the participating teachers, the following were selected to be applied in the proposal: Stickman Warriors, Subway Surfers, Fast Racing, Color Switch, Banana Kong, Beach Buggy Racing, Slither.io, Gravity switch, Rodeo Stampede, Geometry Dash, Minecraft, Temple Run 2. The selection criteria included: ease of access, downloading and navigation, age appropriateness, friendly interface, designed for the users (children between 5-12 years of age), compatibility with tablets using the Android system and popularity. The VICOM-S21 methodology was applied, which is made up by three stages: setting, implementation and assessment.

Stage 1. Setting: in this stage, scenes from the selected videogames were projected with the purpose of focusing students' attention, awakening their curiosity, motivating them to participate, to engage in the experimentation of new roles and developing new skills; this projection was followed by a series of questions that uncovered students' thoughts on what is a videogame, what is the aim of playing it, what needs to be done to win, what may be learned from it, its use in the classroom as a learning tool, and their opinion on being part of a project that uses videogames to develop different competences. At this point, all of the students knew what a videogame is and express it by saying that it is a moving image that is manipulated to attain a goal, they acknowledge that videogames make them happy, entertain and teach them, help them create things, make them feel calm and happy; they also mention that videogames have a purpose which is achieving a goal by overcoming obstacles and levels, each with certain degree of complexity.

Stage 2. Implementation: implementation consists of three activities: one in which the students undertake individual work with the orientation of the researchers and their support group; the other is free individual work; and the last is group work. Activity 1 implies discovery oriented by the teacher, exposes a goal to be attained and provides the student with the opportunity to explore the twelve previously selected videogames; this activity is intended for students to get familiar with the videogames, activate knowledge and dexterities necessary to play and choose their preferences by identifying the characteristics of each videogame. Time was not enough for the students to interact with videogames that had complex gameability in this activity. It must be noted that the videogames with the largest acceptance rates by participating students were the platform and sports kind with simple gameability; the factors that determined the selection of these specific videogames were age range (5-12 approximately) and infrequent interaction with electronic devices prior to the research.

The second activity was free individual work where each student had the opportunity to play maximum five videogames of their choice in two school hours for two days a week throughout a month; the maximum was established taking into account teachers' time availability to develop the activity. The session began by playing with the videogame they thought was the easiest in order to get higher scores compared to other videogames they were not very good at, there is a clear indication that the videogames were primarily selected based on its complexity and not on the type of videogame; however, they autonomously explored other options to learn how to play with the other selected videogames; in cases were they found it difficult, students sought help from their peers or the support group, despite the individual nature of the task.

Finally, the third activity was group work, students were grouped depending on their educational location, each group included students from different grades and each student received a tablet with the same

videogame. They were asked to name the group and to agree on a specific goal, using any strategy they wanted; the goal was defined by the researchers when assigning the videogame. At the end of the session, each group chose a representative to explain the strategy used to achieve the goal. This activity was conducted in five sessions, therefore each group played with five of the videogames that were selected by the researchers, taking into account information provided in the form regarding each student's videogame preferences (in this form, they listed their favorite from one to twelve, with the first one being their favorite). Team work led to the observation that the student who achieved the goal before the other teammates proceeded to collaborate with the intention of having them all achieve the goal; in most cases, this student was in higher grades (4th or 5th) and had found the fastest way to play. Also, there was a leader in each team who motivated others. Particularly, in the locations of Villa Aidee and Veracruz, students switched devices to problem-solve in the allocated time, so someone in disadvantage could play with another tablet while the most skilled teammate cleared the way to the next level.

Stage 3. Assessment of the methodology: after executing the proposed activities, certain suggestions by participating teachers and students were taken into account, including providing more time to the activities because students could not interact with the videogames with complex gameability long enough, adding activities with homogeneous groups since students in the lower grades failed to interact well with the videogames and the older students enforced authority over the younger students, so if they wanted to achieve a goal, they had to give up part of their play time and play a multiplayer game to interact with other teammates.

Cycle 3: feedback: after the formalization and application of the VICOM S-21 methodology and its subsequent observation, an assessment that included suggestions by the participant teachers and students led to a new version of the proposed methodology. The following tables show evidence found in observations conducted in the stage of implementation of the proposal, as well as the indicators that allowed to determine that the VICOM S-21 methodology encourages the development of 21st century competences based on said evidence.

Table 5. *Evidence-theory summary related to the creativity and innovation competence*

Competence	Indicator	Evidence	Related theory
Creativity and innovation	Generates original ideas	When failing to progress on the videogame levels to achieve the proposed goal, students swapped tablets in order for the player with better skills to help the others reach the next level. When facing adverse situations, such as damages or low battery of the device, students planned a strategy to share that device and take individual turns, which ended when the student lost at a certain level	**According to ATC21S** *Creativity and innovation:* capacity to generate original ideas with current value, interpret situations in different ways and visualize a variety of answers to a problem or circumstance
	Interprets situations in different ways	Each student begins playing a videogame they believe to be easy because they may achieve higher scores than in the others; however, students explore different options to learn how to play with the other videogames	
	Visualizes a variety of answers to a problem	When students found a videogame to be difficult and to try to solve problems related to the	

		estimated time to play a videogame, they sought help from their peers or the support group, although the task was individual	

Source: compiled by the authors (2018)

Table 6. *Evidence-theory summary related to the critical thinking competence*

Competence	Indicator	Evidence	Related theory
Critical thinking	Interprets, analyzes, assesses, infers, explains and clarifies meaning	In the methodology's assessment, students are capable to analyze and evaluate the whole process' application of activities, and explain weaknesses and strengths found by them in the process	**According to ATC21S** *Critical thinking:* capacity to interpret, analyze, assess, infer, explain and clarify meaning

Source: compiled by the authors (2018)

Table 7. *Evidence-theory summary related to the problem-solving competence*

Competence	Indicator	Evidence	Related theory
Problem-solving	Proposes and analyzes problems to generate solution alternatives that are efficient and feasible	Strategic thinking to overcome obstacles when playing videogames and making decisions about one technique or another to reach certain goal or level Experimenting failure of the planned strategies to reach certain goal made them	**According to ATC21S** *Problem-solving:* capacity to propose and analyze problems to generate solution alternati

Panorama I

pp. 7-17 I

Volumen 12 I

Número 23 I

Julio - Diciembre I

2018 I

ISSN Impreso

1909-7433 I

ISSN en línea

2145-308X I

		reconsider an action plan to attain the goal	ves that are efficient and feasible

Source: compiled by the authors (2018)

Table 8. *Evidence-theory summary related to the learning to learn competence*

Competence	Indicator	Evidence	Related theory
Learning to learn	Knows, organizes and self-regulates his/her own learning process	Students are developing self-learning by working individually, freely choosing the videogames and dedicating time to develop gameability A student in each team assumed the position of leader in order to encourage others to achieve the goal	**According to ATC21S** *Learning to learn:* capacity to know, organize and self-regulate his/her own learning process

Source: compiled by the authors (2018)

Table 9. *Evidence-theory summary related to the digital technology appropriation competence*

Competence	Indicator	Evidence	Related theory
Appropriation of digital technologies	Explores, creates, communicates ad produces using technologies as tools	Continuous usage of the electronic devices in each activity made it possible for students to appropriate digital technologies	**According to the project ATC21S** *Appropriation of digital technologies:* capacity to explore, create, communicate and produce using technologies as tools

Source: compiled by the authors (2018)

Table 101. *Evidence-theory summary related to the information handling competence*

Competence	Indicator	Evidence	Related theory
Information handling	Accesses information efficiently, assesses it	By interpreting different sources (symbols, rules, characters, board) in the videogame to achieve the goal	**According to ATC21S.** *Information handli

Competence	Indicator	Evidence	Related theory
	critically and uses it creatively and accurately	In the information collection regarding techniques to play videogames	*ng:* capacity to efficiently access information, critically assess it and use it creatively and accurately

Source: compiled by the authors (2018)

Table 11. *Evidence-theory summary related to the communication competence*

Competence	Indicator	Evidence	Related theory
Communication	Knows his/her language and uses it in a wide variety of situations through different media	Constant interaction between students, support group and researchers allows strengthening security, trust and respect in communication Students asked questions on the game's techniques and words related to videogames; this enabled acquisition of vocabulary to communicate amongst themselves in the context	**According to ATC21S** *Communication:* capacity that includes language knowledge and skills to use it in a wide variety of situations and through different media

Source: compiled by the authors (2018)

Table 12. *Evidence-theory summary related to the collaboration competence*

Competence	Indicator	Evidence	Related theory
Collaboration	Works effectively with people to reach a common goal, articulating his/her own efforts	Students seek help from peers or with the support group, although the work is individual The student who achieved the goal first was ready to help his/her teammates with the aim of	**According to ATC21S** *Collaboration:* capacity to work effectively with other people to achieve

Competence	Indicator	Evidence	Related theory
	with those of others	achieving the common goal The student who came up with a technique to play faster told the team to progress on the achievement of the goal	a common goal, articulating his/her own efforts with those of others

Source: compiled by the authors (2018)

Table 13. *Evidence-theory summary related to the life and career competence*

Competence	Indicator	Evidence	Related theory
Life and career	Plans and sets goals	By allocating individual roles and responsibilities in group work activities	**According to ATC21S** *Life and career:* It involves planning and goal setting capacities, as well as capacities to handle obstacles
	Has capacities such as tolerance to frustration, effort and positive internal dialog to persist and deal with obstacles in the way	By being interested in finishing the activities despite difficulties with the use of the device caused by lack of competences in its handling, electricity cuts or some devices being out of order Students learn to wait for their turn to use the Tablet when there were not enough for each	

Source: compiled by the authors (2018)

Table 14. *Evidence-theory summary related to the personal and social responsibility competence*

Competence	Indicator	Evidence	Related theory
Personal and social responsibility	Makes decisions and acts considering what may benefit his/her own wellbeing and that of the planet, understanding the deep connection existing between everybody	Students make decisions by selecting the videogames they prefer / Each team had a student that became the leader, he/she encouraged others to reach the goal / By planning and applying the strategies needed for their team to achieve the goal set in the activities	**According to ATC21S** *Personal and social responsibility:* makes decisions and acts considering what may benefit his/her own wellbeing and that of the planet, understanding the deep connection existing between everybody
	l ethical values	Activities with videogames in the classroom allow students to face competition, evidencing their values and contributing to their training as a comprehensive human being	making a commitment with human rights and universal ethical values

Source: compiled by the authors (2018)

Table 15. *Evidence-theory summary related to the local and global citizenship competence*

Competence	Indicator	Evidence	Related theory
Local and global citizenship	Assumes an active, reflexive and constructive role in the local, national and global community, making a commitment with human rights and universal	For the teams, it was a challenge to achieve the goal, it became clear in their celebrations, in which members jumped up and down and clapped, sometimes even hugged	**According to ATC21S** *Local and global citizenship:* Capacity to assume an active, reflexive and constructive role in the local, national and global community,

Panorama I

pp. 7-17 I

Volumen 12 I

Número 23 I

Julio - Diciembre I

2018 I

ISSN Impreso

1909-7433 I

ISSN en línea

2145-308X I

Conclusions

After establishing the strategies and actions involved in the use of videogames to encourage the development of 21st century competences within a multigrade context, applying the VICOM S-21 methodology and analyzing the changes, advantages and limitations that were identified, the following are the conclusions:

Student heterogeneity in multigrade groups makes it necessary to steer traditional teaching practices towards innovative and flexible strategies (Colbert, 1999; Vargas, 2003; Bustos, 2010); such is the case of the use of videogames, cooperative learning and autonomous learning, which go hand in hand with current society's demands and with students tastes and interests. In that regard, Morales (2009) proposes the use of videogames as tools in schools is a response to a need of use, since most students actively engage in this kind of activity on a regular basis. Likewise, Gomez del Castillo (2007) explains that the use of videogames with teens boost skills such as memorization, perception, spatial recognition, indictive Discovery, logical reasoning, Reading comprehension, vocabulary, problem-solving, strategy planning, self-control, self-assessment, motivation, improvement instinct, curiosity

and eagerness to investigate, social skills, ICT competences among others.

The VICOM-S21 methodology is an educational proposal that is oriented towards incorporating videogames in classrooms based on its pedagogical benefits; when used with an educational intention, videogames cease to be a gaming tool and become a means that foster the development of 21st century competences, which are necessary for today's students to become tomorrow's workers and citizens, according to ATC21S (2015).

One of the strategies proposed by the group of researcher teachers is framed in the modality of free individual work, allowing students to choose the videogames drives an environment based on trust and in which they are free to act naturally and without obligation, confirming the idea of Charms (as cited in Tapia, 2005). A second strategy proposes guided discovery in which the teacher provides input, states the goal to be reached and gives the student the opportunity to explore the previously-selected videogames to decide based on his/her own experience. Exploring several videogames gave the students the chance to become familiar with them, activating knowledge and dexterities necessary to play and choose their preferences, confirming Jerome Bruner's theory on discovery learning, in which he affirms the student must discover knowledge and organize it in his/her cognitive structure in different representation levels in order to create new knowledge by transforming the information that is incorporated from his/her experience (Quaaz and Crespo, 2003).

It must be highlighted that the VICOM-S21 methodology uses the 21st century competence classification proposed by the ATC21S project, in which competences are grouped in four categories: ways of thinking (creativity and innovation, critical thinking, problem-solving and learning to learn); tools to work (appropriation of digital technologies and information handling); ways of working (communication and collaboration); and ways of living in the world (life and career, personal and social responsibility, and local and global citizenship). Evidence found in the observations conducted in the implementation and proposal stage and its contrast with the indicators suggested by the ATC21S project allowed determining that the VICOM-S21 methodology develops 21st century competences but does not establish a level or degree of development for each one.

After applying the strategies set forth in the VICOM-S21 methodology, it can be stated that for students in the different multigrade locations of the Mariscal Sucre educational institution, the use of videogames in the classroom became a fun, entertaining and relaxing way of learning that helps them create things, stay calm and concentrate; they also acquire patience, skills to overcome obstacles and attain a goal, increase their imagination and use electric devices, thus confirming the educational potential of videogames and their influence on the development of skills that are necessary to become a 21st century citizen (Ellis, 2006; Galarneau, 2006).

It is worth mentioning that the videogames with the most acceptance by students participating in this research were the platform and sports kind with simple gameability, this is connected with their age range (5-12) and with infrequent interaction with electronic devices prior to the study; however, students autonomously explored different options to learn how to play other videogames, adapting and making progress at their own rate, moreover, they sought the help of their peers when they faced difficulties.

Strategies based on videogames in which students work in groups enable interaction between students, regardless of their academic level, inspire sharing experiences and improve interpersonal relationships, integrating them with a common goal. Also, activities with videogames in the classroom allow students to face situations of competition, evincing their values and contributing to becoming a wholesome human being. This proves the four fundamental principles of cooperative learning explained by Kagan and Kagan, (1994).

On the other hand, the research transformed the daily practices applied by researcher teachers in the classroom, which were perceived as monotonous and had failed to apply the locations' ICT tools, this allowed them to reflect on the need to use and create innovative and flexible strategies within the learning context. A remarkable change of attitude was evident in the researcher teachers, who accepted the use of ICT and started participating in projects that involve ICT tools, confirming the theory of Esteban (2003) regarding the fact that the reality of practices which involve people in a problem to collaboratively solve them by reflecting on their needs and experiences can be changed.

This research is connected with international standards on competences that must be developed for teens to become effective workers and citizens in the knowledge society of the 21st century, and with the first line of research proposed by Colciencias' National Science and Technology Plan for 2017-2022, which considers gamification as "the use of gaming mechanisms to encourage participation in non-play scenarios and change behaviors of an audience with the aim of accomplishing results". Also, it sets the fundamental basis for developing studies that apply the use of ICT-based methodologies, supported in international references for competences in educational contexts whose nature demands didactic innovation and systematic ad challenging pedagogic interventions.

REFERENCES

1. Ananiadou, K. y Claro, M. (2010). *Habilidades y competencias del siglo XXI para los aprendices del nuevo milenio en los países de la OCDE*. Recuperado de: http://recursostic. educacion.es/blogs/europa/media/blogs /europa/informes/Habilidades_y_comp etencias_siglo21_OCDE. pdf.

2. ATC21S. (2015). *ATC21S*. Recuperado de http://www.atc21s.org/

3. Bustos, A. (2010). Aproximación a las aulas de escuela rural: heterogeneidad y aprendizaje en los grupos multigrado. *Revista de Educación*, (352), 353-378.

4. Colbert, V. (1999). Mejorando el acceso y la calidad de la educación para el sector rural pobre. El caso de la Escuela Nueva en Colombia. *Revista Iberoamericana de Educación*, (20), 107-135.

5. Colciencias. (2016). Plan Nacional de Ciencia, Tecnología e Innovación para el desarrollo del sector de las Tecnologías de la Información y las Comunicaciones (TIC). Recuperado de http://www.colciencias.gov.co/sites/defau lt/files/plan-ctei-tic-2017-2022_0.pdf

6. Eguia, J., Contreras, R. y Solano, L. (2012). Videojuegos: conceptos, historia y su potencial como herramienta para la educación. *3C TIC*, (2), 1-14.

7. Ellis, H, Heppell, S., Kirriemuir, J., Krotoski, A., y McFarlane, A. (2006). *Unlimited Learning: Computer and Video Games in the Learning Landscape*. Technical Report, Entertainment and Leisure Software Publishers Association and Press enquiries.

8. Esteban, M. (2003). Investigación cualitativa en educación. Fundamentos y tradiciones. Madrid: Mc Graw and Hill Interamericana.

9. Ferrer, M. y Ruiz, J. (2005). Uso de videojuegos en niños de 7 a 12 años. Una aproximación mediante encuesta. *Revista de Comunicación y Nuevas tecnologías*, *4*(1), 205-216.

10. Galarneau, L. y Zibit, M. (2006). Online Games for 21ˆst Century Skills. *Ulearn*, (6), 58.

11. Gee, J. (2004). Lo que nos enseñan los videojuegos sobre el aprendizaje y el alfabetismo. Archidona, España: Aljibe.

12. Gómez del Castillo, M. (2007). Videojuegos y transmisión de valores. *Revista Iberoamericana de comunicación, 43*(6), 1-10.

13. Kagan, S. y Kagan, S. (1994). *Cooperative learning*. San Juan Capistrano: Kagan Cooperative Learning.

14. Latorre, A. (2007). La investigación-acción: conocer y cambiar la práctica educativa. Barcelona: Graó de IRIF, SL.

15. Levis, D. (2013). *Los videojuegos, un fenómeno de masas*. Buenos Aires: Sivel.

16. Ley N° 115. (1994). Ley general de educación de la República de Colombia. Bogotá, Colombia.

17. Morales, E. (2009). El uso de los videojuegos como recurso de aprendizaje en educación primaria y Teoría de la Comunicación. *Diálogos de la comunicación,* (78), 7.

18. Quaas, C. y Crespo, N. (2003). ¿Inciden los métodos de enseñanza del profesor en el desarrollo del conocimiento metacomprensivo de sus alumnos? *Revista signos*, *36*(54), 225-234.

19. Tapia, J. (2005). Motivación para el aprendizaje: la perspectiva de los alumnos. Madrid: MEC.

20. Vargas, T. (2003). Escuelas multigrados: ¿Cómo funcionan? Reflexión a partir de la experiencia evaluativa del proyecto Escuelas Multigrado-Innovadas. República Dominicana: Editora de Colores S.A. Recuperado de: http://unesdoc. unesco. org/images/0013/001374/137497so. pdf.