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# The Risk of Emergence of Boomerang Effect in Communication against Violence

Riesgo de aparición del efecto boomerang en las comunicaciones  
contra la violencia

## ABSTRACT

Violent behaviors cause concern among people, policy makers, politicians, educators, social workers, parents associations, etc. From different fields and perspectives, measures are taken to try to solve the problem of violence. Institutional communication campaigns against violence and the publication of news related to violent events are often some of the actions used by policy makers. But some of the literature and data have shown that its effectiveness is not always exactly as expected. And even some anti-violence messages, can have the opposite effect and reinforce the attitudes of those who thought that violence is necessary. The hypothesis is that most people assume with no problem the core message of anti-violence campaigns. But, and this is the key issue and most problematic, individuals who are more likely to be violent (precisely those who should address such communications) could react to anti-violence message in a violent way. There is a tragic paradox: the anti-violence message could increase the predisposition to violent behavior. This would be a case of what some literature called boomerang effect. This article highlights the need for detailed empirical studies on certain effects of media (desensitization, imitation, accessibility and reactance), which could help explain the emergence of the boomerang effect.

## RESUMEN

Los comportamientos violentos causan inquietud entre los responsables públicos (políticos, educadores, asistentes sociales, asociaciones de madres y padres, etc.) que, desde diversos ámbitos, toman medidas que tratan de dar solución al problema de la violencia. La difusión de campañas institucionales de comunicación en contra de la violencia y el fomento de la publicación de noticias relacionadas con sucesos violentos suelen ser algunas de las acciones utilizadas. No obstante, parte de los datos y de la literatura disponible han demostrado que su eficacia no siempre es la esperada e, incluso, dichas acciones pueden llegar a tener efectos contrarios al deseado y reforzar las actitudes de los que piensan que la violencia es necesaria. Se sostiene la hipótesis de que la mayoría de la población asumiría como propios los mensajes contrarios a la violencia. Sin embargo –y esto es la cuestión clave y más problemática– son justo aquellos individuos con mayor propensión a la violencia (precisamente aquellos a quienes deberían dirigirse tales comunicaciones) quienes podrían reaccionar ante el mensaje antiviolencia de un modo no deseado. Se da una dramática paradoja: el mensaje antiviolencia podría aumentar la predisposición a desarrollar comportamientos violentos. Estaríamos ante un caso de lo que cierta literatura denomina efecto boomerang. Por último, se señala la necesidad de un estudio detallado sobre determinados efectos de los medios de comunicación (insensibilización, imitación, accesibilidad y reactancia), que podrían ayudar a explicar la aparición de dicho efecto boomerang.

## KEYWORDS / PALABRAS CLAVE

Media effects, violence, institutional campaigns, the boomerang effect, desensitization, imitation, accessibility, reactance. Efectos de los medios, violencia, campañas, efecto boomerang, insensibilización, imitación, accesibilidad, reactancia.

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## 1. Introduction. Violence as a social problem

Today violent behavior is one of the problems that most concerns society as a whole. Numerous public institutions and diverse social-action organizations (NGOs, Anti-violence associations, etc.) have begun to implement different initiatives to eradicate or at least minimize violent conduct as much as possible.

In this article we concentrate on those initiatives that focus on awareness and sensitization campaigns against violence in order to consider the extent to which these measures are effective and explain why they may be failing. We begin with two proven facts: a) an important communicative effort is being made against violence, but at the same time, b) the data suggest that this effort is not generating the desired results.

The evidence that an important dissemination effort is underway is that the anti-violence awareness campaigns have required a significant economic investment over the last several years. For example, according to the Spanish Ministry of Equality, in 2008 the state-funded campaign against gender violence *Ante el maltratador, tolerancia cero* cost 4 million euros to fund.

Nevertheless, the desired results have not yet been achieved. Despite the existence of these awareness campaigns, violent behavior has not decreased, with some of the indicators reflecting truly alarming statistics. For example, in the last decade, the total number of violent crimes has experienced a significant increase:

Crimes perpetrated against people's lives, integrity and liberty									
2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
59,737	62,722	69,559	91,070	96,034	98,701	101,437	105,009	104,883	103,647
Number of deaths from gender violence									
2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
50	54	71	72	57	69	71	76	56	73

Sources: Interior Security Studies Cabinet. Ministry of Interior, and Ministry of Health, Social Policy and Equality.

Meanwhile, the statistics of victims of gender violence in Spain during the last decade also show a similar worrying trend despite the fact that now is precisely when more measures are being put into place to eradicate this serious social problem<sup>1</sup>.

Therefore, the question that needs asking is: What is going wrong? Although it is evident that social phenomenon can result from diverse causes, one of the possible reasons may be the clearly limited effectiveness of the campaigns designed to sensitize the population against the use of violence. This would explain why the statistics on the occurrence of violence remain unchanged, or do not show a significant decrease.

How can one explain that the number of violent acts increase after awareness campaigns? In this case, we are not only talking about the ineffectiveness of these campaigns, but also of a much more relevant and problematic issue: the possibility that an unforeseen perverse effect is being generated. Our hypothesis is that although the majority of people take on the anti-violence message as their own, there is a reduced number of individuals with a higher propensity towards violence that may react to these messages in a very undesirable way, in that the campaign's message may cause a higher predisposition in them for developing violent behavior; resulting in what some literature calls the boomerang effect.

In this context, critical reflection is needed to determine the social consequences of anti-violence awareness campaigns and identify the causes behind their apparent failure, and at the same time allow us to find the key to developing new campaigns that would be more effective against all types of violence. Several lines of reasoning can aid in explaining the problem. In this article, we will discuss some of them in detail.

## 2. The root of the problem

When designing an awareness campaign, one of the first steps to follow is to determine to whom the message is directed, who our target audience is. This means that the characteristics of the intended recipient of the campaign may be quite diverse and in the case

of sensitization campaigns against violence, it may be especially important to keep in mind that some people are more prone to violent behavior and that

their exposure to the campaign could generate different responses in them than those expected.

According to data from a 2008 survey on the use of cellular phones among minors, a sample from the Autonomous Region of Madrid of 1053 minors between 10 and 16 years of age demonstrates that roughly 10% of the child and young adult population are particularly prone to violent behavior (García Galera & al., 2008). The results of this study reveal that these young people confess their desire to record the hooliganism of others, show indifference to or enjoy watching violence posted on the Internet, and even on occasion have used their cellular phones to

film fights, humiliating or violent acts (for example, pranks played on professors) or have posted these recordings on the Internet (YouTube, MySpace).

This is clearly alarming data, and presents us with a phenomenon that is quantitatively and qualitatively relevant to social coexistence. We are witnessing a scenario in which certain youths demonstrate an elevated degree of insensitivity and tolerance toward certain acts of violence, which they not only enable, but on occasion sometimes participate in. In our opinion, this data should be considered when designing anti-violence campaigns that aim to sensitize this target audience that unquestionably is the intended recipient of the message.

### 3. The risk of the boomerang effect in awareness campaigns: Empirical evidence

If, as mentioned above, the main institutional strategy used to combat undesired social behavior consists of the dissemination of awareness campaigns aimed at sensitizing the population with respect to different social and public health problems (abuse of alcohol, tobacco or other drugs), it has been demonstrated that in certain circumstances, these campaigns could be generating an effect contrary to the intended one. In fact, it would appear that it may be precisely the very target audience of these campaigns (alcoholics, smokers or drug-addicts) who are more prone to reject or experience the boomerang effect from the institutional message.

In this respect, in a variety of fields where institutional campaigns are used to warn about the risks of developing certain behaviors, an abundance of empirical evidence is being gathered on the boomerang effect. Of special significance are the following: campaigns that stress the risks of smoking (Hyland & Birrell, 1979; Robinson & Killen, 1997; Unger & al., 1999); campaigns against drug use (Feingold & Knapp, 1997); or those that focus on alcohol consumption (Ringold, 2002).

In the field of violence, there is a limited corpus of investigations, although one could cite studies such as the one by Bushman and Stack (1996) in which they

reveal how the use of labels that alert about the broadcasting of programs with violent content could increase the audience's interest for viewing the programs. If, as it has been demonstrated, a relationship exists between the exposure to violent content and the subsequent impulses and acts of violence, the problem would be that the use of these labels leads to a higher consumption of measured violence, and as a consequence, a higher level of real violence.

### 4. The risk of the boomerang effect in anti-violence awareness campaigns

#### 4.1. An explanation based on the proven media effects

There is a long tradition of in depth studies done on media effects<sup>2</sup>. Some of these effects have contras-

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ted empirical evidence, such as the ample consensus in the scientific community on the relationship that exists between the consumption of audiovisual violence and the tendency to develop violent behavior in the child and young adult population<sup>3</sup>. In fact, a number of studies have achieved significant results when correlating the exposure to violent content in the media (mainly on television and in video games) with the generation of violent thoughts, attitudes, and behavior. These effects have been demonstrated for the short, medium and long term. Relevant conclusions have been made for both men and women, and equally significant results have been obtained in a variety of situations studied in different countries. Among others, we can cite the studies by Huesmann and Moise

(1996), Anderson (1997), Anderson and Dill (2000), Anderson and Bushman (2002), Huesmann & al. (2003), Anderson & al. (2003), Gentile & al. (2004), and Huesmann and Taylor (2006).

In order to demonstrate the influence that the consumption of audiovisual violence may have on the generation of violent behavior, different mechanisms are used; among which the desensitization effect and the imitation effect stand out. The former allows us to explain why the anti-violence campaigns are ineffective in reducing the number of violent acts; while the latter could explain not only why the campaigns are not effective, but also why sometimes these campaigns generate an effect contrary to the one desired by increasing the probability that violent acts take place.

#### 4.1.1. Desensitization effect

Although it is true that the exposure to violent content initially produces a rejection response, it is also true that repeated exposure to violence ends up creating a process of decreased response or habituation. When presented with successive violent images, the spectator tends to show progressively smaller psychological and emotional responses. A state of emotional desensitization can be reached in which there are no emotional responses to stimuli that when viewed for the first time caused a strong response. Similarly, a cognitive desensitization is produced when violence is no longer considered as something infrequent or abnormal and begins to be viewed as an inevitable and normal aspect of daily life. Both emotional and cognitive desensitization can influence behavior, resulting in either a decrease in the probability that the desensitized person is critical of violent conduct or an increase in the probability that desensitized people develop aggressive conduct, which in turn may be more intense (Drabman & Thomas, 1974; Drabman & Thomas, 1976; Thomas & al., 1977; Molitor & Hirsch, 1994; Carnagey, Anderson & Bushman, 2006).

The desensitization effect has also been studied in investigations on the effectiveness of warning labels on certain products that may be harmful to a person's health or security. In these studies, the repeated exposure to warning labels of all types (food, road safety, etc.) is found to be a contributing factor when people stop paying attention to them, even leading them to ignore many of them altogether (Twerski & al., 1976). This is especially true in those cases in which the harmful consequences do not immediately arise after engaging in the risky behavior, leading us to what Breznitz (1984) calls false alarms. An example of this would be the messages warning of the risks associated

with smoking: while in the opinion of this author it is evident that drinking bleach has an immediate adverse effect, smoking a cigarette does not appear to have any, which makes the warning labels on cigarette packs less effective.

When applying this reasoning to the question of violence, it may be that some especially violent people feel a type of immunity effect regarding their actions, since the immediate consequences for the aggressor of a violent action (for example the prison sentences associated) are seldom discussed. Violent people who consider violence to be a normal part of daily life (cognitive desensitization) may believe (the same as some smokers) that their violent conduct will not result in any negative consequences for them.

Although the desensitization effect may not necessarily be related to the appearance of a boomerang effect, it is important to highlight that the greater the desensitization the person experiences towards violence, the less efficient the anti-violence awareness campaigns will be. Furthermore, if a person's level of desensitization impedes them from reacting to real-life violence it is unlikely that the anti-violence messages (that usually deliberately avoid using damaging images) will have any effect on them.

#### 4.1.2. Imitation effect

A social creature by nature, the human being learns to repeat or imitate behavior that is apparently valid or common by observing the other members of its community. Because of this, one of the most characteristic effects associated with the media is known precisely as the imitation effect. In the context of anti-violence awareness campaigns, this effect is produced solely in the case of messages that contain violence: news stories that contain explicit violence or campaigns that use images with violent content.

This imitation effect can be produced through two different mechanisms, both possibly resulting in an undesirable boomerang effect. They can be observed through increased violent conduct immediately following an awareness campaign or media piece containing violence:

a) Instrumental validity: the spectator imitates the behavior they view because they deduce that it is useful, since the person who has carried out the action has obtained something beneficial by behaving a certain way. In particular, in the context of violence, studies exist that demonstrate how children and adolescents not only tend to imitate the behavior of those people they interact with most frequently (family members, parents, etc.) but also media personalities.

Along these lines, classic studies not only show that children imitate aggressive conduct exhibited by adult role models (Bandura & al., 1961), but that they also imitate the conduct of fictional characters (Bandura & al., 1963a). This is especially true when the imitated action is seen to have a reward (instrumental learning) or when the role model is admired or identified with. Therefore, one can deduce from this that if the awareness campaigns contain violence, they could generate more violence by imitation. Or in other words, it would be preferable that awareness campaigns and news stories on violence avoid displaying violent content in order to avoid the imitation effect.

b) Social validity: the spectator imitates a conduct that they perceive many people to be carrying out, and therefore, they presume that it must be correct behavior. Numerous studies show how people tend to behave the same way other people do since the fact that other people behave a certain way is interpreted as a validating factor about the appropriateness of the behavior (Gould & Shaffer, 1986; Reingen, 1982). This is a factor to consider when designing anti-violence awareness campaigns. Recent studies have shown that when trying to eradicate an undesirable behavior (for example violent behavior) a message that states that unfortunately many people still behave in a certain way may have the exact opposite effect since many of the campaigns focus the public's attention (especially those with higher tendency towards the behaviors in question) more on the prevalence of the action, providing it with more visibility, than the undesirability of the action (Cialdini, 2003; Cialdini & al., 2006; Shulz & al., 2007). Along these lines, recent studies (Vives, Torrubiano and Álvarez, 2009) have brought to light that television news reports on gender violence have a negative influence on the number of deaths attributed to male violence.

## 4.2. Other mechanisms that could explain the boomerang effect

In addition to the aforementioned documented media effects, we deem appropriate the mention of two mechanisms that could explain the emergence of the boomerang effect after the dissemination of anti-violence awareness and sensitization campaigns: enhanced accessibility and psychological reactance.

### 4.2.1. Enhanced accessibility

As we have already suggested, the use of images with violent content in anti-violence messages could increase the probability that violent behavior is reproduced in the future. We believe that a new alternative

explanation is possible, based on the fact that the exposure to these images could cause these violent behaviors to be more accessible to the recipients' minds. Taking it a step further, accessibility (the ease or speed that a construct or concept comes to mind) could also help to explain the possible perverse effect of anti-violence awareness campaigns even when they do not contain violent content. In line with previous investigations that found that the attempt to eliminate certain thoughts can make them even more accessible (Wegner, 1994), a hypothesis could be made that the mass media's use of messages that refer to violence (even when the ultimate purpose is to criticize it) can have a negative effect by activating and increasing accessibility to violent thoughts and ideas, especially for those individuals already particularly prone to violence.

### 4.2.2. Psychological reactance

Psychological reactance has been defined as the state of psychological stimulation that arises when our freedom appears to us to be limited or threatened (Brehm and Brehm, 1981). The most direct consequence of this state is a tendency to resist everything that could be considered as a threat to one's personal liberty (Brehm, 1966). Therefore, in the same way that we tend to show reactance when, for example, we are told how to think or we are given orders, we tend to experience reactance when certain behaviors are forbidden (Dillard & Shen, 2005; Miller & al., 2006; Miller & al., 2007). This means that those people who behave in a way that is criticized by the authorities reaffirm their actions as being a defense against a threat to their way of life.

This is also the same motive that leads people to more intensely desire information that has been censored (Worchel & Arnold, 1973). The explanation is found in the need that some people feel to engage in risky or taboo behavior, or to violate societal norms. Stewart and Martin (1994) believe that the warning messages about the risks associated with certain behaviors attract the attention of some people, impelling them to behave in the manner that was trying to be prevented. It is like eating the forbidden fruit (Bushman & Stack, 1996).

As a result, many researchers have identified psychological reactance as one of the main factors for explaining the boomerang effect caused by different media campaigns (Bushman & Stack, 1996; Ringold, 2002; Hornik & al., 2008). From our perspective, this could also apply to the anti-violence campaigns that generate a boomerang effect when individuals who

are more prone to violence or who routinely use violence in their daily lives come into contact with campaigns that prohibit or criticize violence.

### 5. Conclusions

The need to consider the effects of desensitization, imitation, accessibility and psychological reactance in the awareness campaigns and information dissemination on violence. In summary, the difficulties of ending violent behavior could be related to the lack of adaptation between the objectives proposed by those responsible for social policy (such as the eradication of all violent conduct) and the communication strategies

which is even more worrying. If this is the case, not only do we have useless campaigns, but also the risk that the messages about violence or those containing violence may actually cause violent behavior. The imitation effect has abundant empirical evidence supporting it, and therefore institutional awareness campaigns generally keep it in mind. The information disseminated through the media presents a bigger problem since it does not always comply with these standards (Vives, Torrubiano & Álvarez, 2009).

Finally, the risk that the messages against violence are not fulfilling their objectives could also be related to two especially relevant psychological effects. On

one hand, the research on construct accessibility show that any message about violence, even those whose aim is to combat it, can cause the concept of violence to be more present in people's thoughts. On the other hand, studies on reactance beg us to consider the tendency for certain people to position themselves against any message that may threaten their freedom or self-esteem.

At the same time, it is important to add that in the case of the messages designed to combat violence these effects could intensify in those individuals that are particularly prone to developing violent conduct. This is especially worrying since those who are more prone to developing violent conduct are the target audience for anti-violence messages.

This suggests that inefficient strategies are being implemented, or what is worse, we may be increasing the probability that violent behavior occurs after the dissemination of informative or sensitization messages. As a result, the theoretical reflection and bibliographical review that we have carried out shows the need for a more exhaustive study to be conducted on phenomenon such as desensitization, imitation, enhanced accessibility, and psychological reactance, in order to create a more efficient design for future anti-violence communication campaigns. Specifically, it is particularly necessary that empirical research be developed that would allow for the experimental verification of the hypothesis proposed in this paper.

### Notes

<sup>1</sup> In 2004 the Ministry of Equality was created (incorporated in October 2010 as Secretary General of the new Ministry of Health, Social Policy and Equality) that has implemented diverse measures

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used (such as the anti-violence awareness and sensitization campaigns in the media).

Our aim here is not to assert that the messages about violence in the media or in certain institutional awareness campaigns are the only causes of violence, but rather to point out that not all of the well-meaning institutional campaigns or anti-violence information reach their goal of preventing violence, and that these initiatives could result in harmful effects (the boomerang effect) just as in other areas (for example, the case of drug consumption).

It is our belief, therefore, that in order to avoid generating any negative effects, the different risks shown in the studies on media effects should be taken into account when designing any anti-violence awareness campaigns or portraying violence in the news.

A two-fold proposal for reaching this goal would necessitate on the one hand that the existing studies on desensitization be consulted. Although at first the existence of information and campaigns may have had a positive effect towards the eradication of violence, the reiteration of those messages may have led to the desensitization of the recipients, thus suggesting the possible ineffectiveness of the messages being disseminated. On the second hand, it should be kept in mind that an imitation effect is possibly being generated,

of prevention, sensitization and action such as the Ley Integral contra la Violencia de Género (L.O. 1/2004) (Law on Integral Protection Measures against Gender Violence), awareness campaigns, pedagogical activities, and a personal attention telephone line, etc.

<sup>2</sup> Due to the abundance of publications on media effects, several texts have tried to systematize published information of the research on the effects. Among the classics, the work by authors McQuail (1991) or Wolf (1994) stands out. At the same time, a background in the research in Spanish is had by consulting the work by Brändle, Martín Cárdbaba, and Ruiz San Roman (2009); Igartua & al. (2001); Fernández Villanueva & al. (2008); Cohen (1998); and Barrios (2005).

<sup>3</sup> The recent elaboration of a text presented to the Supreme Court in the United States by the American Psychological Association (APA) and the American Academy of Pediatrics (AAP) that warned of the proven relationship that exists between the use of violent video games and the subsequent aggressive conduct displayed by children and adolescents (see American Academy of Pediatrics, 2009) is evidence of the consensus among the scientific community.

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# Classroom 2.0 Experiences and Building on the Use of ICT in Teaching

Aulas 2.0 y uso de las TIC en la práctica docente

## ABSTRACT

Recognising the importance of new technology in the classroom, our aim is to promote the integration of information and communication technology (ICT) in teaching practice from a collaborative research in which action research style methods are applied involving 21 primary and secondary schools in Spain. In these research seminars, the participating teachers receive a progressive educational and technological training orientated towards the experiment and reflect on the possibilities of using a computer per student in the classroom and a digital whiteboard or interactive whiteboard (IWB). After the first period of research, we bring to the table significant ideas that have guided the training and put forward findings on the testing of teachers in their classrooms denoted classrooms 2.0 for being equipped with an IWB and computers with Internet access. In specific, from this experiment, we provide relevant results on the intensity of use of IWBs and computers, the usual activities conducted with these technological resources, their advantages and disadvantages found from use and their impact on student learnings. In the conclusions, the results are analysed and assessed, noting possible criteria for taking action in order to move twenty-first century teaching practices forward and promote the inclusion of ICT in classrooms.

## RESUMEN

Asumiendo la importancia de las nuevas tecnologías en las aulas, pretendemos impulsar la integración de las tecnologías de la información y de la comunicación (TIC) en la práctica docente desde una investigación colaborativa donde se aplican metodologías cercanas a la investigación-acción y participan 21 centros de educación primaria y secundaria de España. En los seminarios de esta investigación, el profesorado participante recibe progresivamente una formación didáctica y tecnológica orientada hacia la experimentación y la reflexión de las posibilidades de uso de un ordenador por alumno, en el aula, y de la pizarra digital o pizarra digital interactiva (PDI). Después del primer periodo de la investigación, aportamos ideas significativas que han guiado la formación impartida y avanzamos información de la experimentación del profesorado en sus aulas denominadas aulas 2.0 por estar dotadas de una PDI y de ordenadores con acceso a Internet. Concretamente, de esta experimentación, aportamos resultados relevantes sobre la intensidad de uso de la PDI y de los ordenadores, las actividades habituales realizadas con estos recursos tecnológicos, sus ventajas e inconvenientes destacables al utilizarlos y sus incidencias de uso en los aprendizajes de los estudiantes. En las conclusiones, se analizan y se valoran los resultados, apuntando posibles criterios de actuación para ir avanzando en la práctica docente del siglo XXI y en la inclusión de las TIC en las aulas.

## KEYWORDS / PALABRAS CLAVE

ICT, education, technology, training, teachers, students, IWB, computers, Interactive whiteboard.  
TIC, educación, tecnología, formación, profesorado, alumnado, PDI ordenadores, pizarra digital.

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## 1. Introduction

Throughout history, new technology has always changed those societies where it has been implemented (Cabero, Lorente & Román, 2007: 1). Information and communication technology (ICT) is now one of the most effective agents of social change due to its impact on society. Faced with the emergence of ICT in our society, it goes without saying that the educational world cannot be immune to these changes.

In the field of education, ICT can provide a teaching and learning environment for both students and teachers. According to Cabero (2006), ICT offers new environments and settings for training with significant features, such as, expanding the range of information, training and tutoring opportunities, eliminating time-space barriers, facilitating collaborative work and self-learning, as well as enhancing interactivity and flexibility in learning. At the same time, Marquès (2008) highlights that ICT adds to the resources we are already using; ICT is a readily available resource for teachers, and, as emphasised by Gairín (2010), ICT facilitates the collective creation of knowledge.

In line with these approaches, our research experiment is designed around the use of a whiteboard or interactive whiteboard (IWB) in the classroom, along with a study of the notion of one computer per student. This research analysed ICT integration at 21 primary and secondary schools in Spain. The teaching staff carried out experiments in their classrooms, which we call Classrooms 2.0 as they are equipped with an IWB and computers with Internet access, with the aim of considering the current demands of 21<sup>st</sup> century society on schools that use ICT.

Teachers and/or managers of these participating institutions have a positive stance towards intervention in research and/or the use of ICT in the classroom. Therefore, the results and conclusions of this research are somewhat limited because they are interpreted within a positively biased teacher and/or management context.

Evidently, what the teacher thinks about the educational potential of ICT conditions its use in teaching practice (Tejedor, García-Valcárcel & Prada, 2009: 117). Our research also examines the stumbling blocks that hamper teachers' use of technology, such as those highlighted by Calderón and Piñero (2007), resistance to change, lack of technical training, the effect on self-esteem and the frustration felt by teachers.

Then, we present a brief bibliographic review of the technological resources under study in our research (IWB and computers):

- Plenty of research into IWBs confirms that they

are a good resource for use in teaching. The research generally highlights the advantages of IWB use for teachers and students. In Anglo-Saxon countries, there are significant research contributions on IWBs from Bell (2002), Glover and Miller (2001), Levy (2002) and Walker (2003), and we can also mention three IWB research centres: the UK government agency BECTA, the US government agency NCEF and the Canadian company SMART. In Spain, there have been several investigations with promising results that point to the benefits of this resource, notably the Iberian Research Project (Gallego & Dulac, 2005) and investigations by the research group DIM (Marquès & Domingo, 2010; 2011).

- There is also considerable research into the use of computers in the classroom, but the findings on the contribution of computer use in the classroom and improving student performance are contradictory. Despite these discrepancies, the computer makes for an effective tool at school, a valuable information resource and an interesting teaching support (Ton-deur, Van Braak & Valcke, 2007).

- Research into the benefits of using the computer at home and improving academic performance is on the increase. Hence, the household computer and Internet access not only contribute to the acquisition of digital skills which prove useful when using this medium at school, but also favour the development of valuable cognitive strategies for school performance (Kuhlemeier & Henkel, 2007).

- We highlight a recent comparison on computer usage and performance (at home or in the classroom): The frequency of computer use at home generates greater performance in the PISA test than the frequency of computer use in the classroom (OECD, 2010).

## 2. Materials and methods

We present a collaborative research in which procedures are applied to action research to investigate teaching practice following classroom training, reflection and experimentation on the educational applications of IWBs and students' computer use. The research is conducted in two periods: from December 2009 to July 2010 (first period) and September 2010 to July 2011 (second period).

This research involves 120 teachers from 21 Spanish public and private schools at all levels of primary and secondary education with a total of approximately 3,000 students. The 21 participating schools are from different parts of Spain. Each area has a local research moderator who organises 5 seminars at the centres.

In each of these seminars, the moderator acts as a supervisor of the action research process while giving basic technical training on the use of IWBs and computers in the classroom and progressive didactical training on teaching and learning activities. Some significant ideas that guide the training are:

- The teacher loses his monopoly regarding the transmission of information in the face of a new form of student and society. Their work aims to make students find their own cognitive and relational belongings in the pluralistic world that we live in (Tello & Aguaded, 2009: 45).

- Today's media and entertainment (Internet, television and other standard screens) affect children more directly and universally than traditional media (Camps, 2009: 140).

- The introduction of social software extends the capabilities of communication, interaction and information exchange among participants. It also facilitates collaborative work generated within a virtual space (Del Moral & Villalustre, 2008: 74).

- It is fundamental to train people to be up-to-date with both existing and emerging technology... appropriately using the technology at each instance (Sancho, 2009a). It is fundamental to reflect on where these actions may lead, look at what is left to do and foresee what might be achieved (Sancho, 2009b: 30).

In these seminars, teachers comment on the activities, highlighting strengths and weaknesses and bringing up questions or problems. Also, we discuss recommendations and guidelines on the actions and use of technology in classroom practices (Area, 2007: 5). Finally, after each workshop, teachers will experi-

ment with the activities that seem most appropriate and they also have access to online information in the research portal (DIM UAB, 2010).

The assessment questionnaire is the data collection tool that complements the minutes of each seminar. There will be 130 completed assessment questionnaires by the end of the first period of the investigation. The format of the questionnaire has already been used in other DIM research.

In summary, during the first period, the most significant activities of the investigative work plan were:

Prominent dates	Activity	Description
December 2009	START OF INVESTIGATION	Preparatory actions: selection of moderators, centres and technological resources to use in the coordinating centres.
January 2010	SEMINAR 1_1 (First period: Seminar_1)	The moderators present the research and provide initial training. Activities to be carried out are planned. We give out the initial questionnaire to be returned completed in June.
February / April 2010	EXPERIMENTATION	The teacher experiments in the classroom, following the planning laid out in seminar1_1 and the training received.
May 2010	SEMINAR 1_2 (First period: Seminar_2)	The teacher explains what was done with the IWB and computers. Reflecting on teaching practice and further training (with emphasis on the educational use of the IWB and computers). Lastly, the course of action is laid out.
May / June 2010	EXPERIMENTATION	The teacher experiments in the classroom, following the planning laid out in seminar1_2 and the training received.
July 2010	REPORT_1 (End of first period)	The report of the first period of research is elaborated mainly from the completed questionnaires.

During the second period, the most significant activities of the investigative work plan will be:

Prominent dates	Activity	Description
September 2010	SEMINAR 2_1 (Second period: Seminar_1)	Upgrading the technical and educational training. Performance review and planning of activities to be carried out. The questionnaire to be given back completed in May is handed out.
October / January 2011	EXPERIMENTATION	The teacher experiments in the classroom, following the planning laid out in seminar 2_1 and the training received.
February 2011	SEMINAR 2_2 (Second period: Seminar_2)	The teacher explains what was done with the IWB and computers. The moderator imparts further training and the activities to be carried out are planned.
February / May 2011	EXPERIMENTATION	The teacher experiments in the classroom, following the planning laid out in seminar 2_2 and the training received.
May 2011	SEMINAR 2_3 (Second period: Seminar_3)	The teacher explains what was done with the IWB and computers and puts forward the end assessments from the final questionnaire.
June and July 2011	FINAL REPORT (Final investigation)	Final report of the investigation obtained from the experiments carried out.

### 3. Results

This section presents the results from the first period of investigation (December 2009 to July 2010).

#### 3.1. Depth of IWB and computer use in classrooms

During this first period of research, many of the teachers and students carried out a fairly intensive use of the IWB and computers, although somewhat less in the latter case. We emphasize that 50% of teachers

use the IVB in almost 50% of their teaching and instead only use computers in about 25% of their teaching.

These results are partly logical because of the short experimental period and the fact that teachers only attended 2 seminars. In addition, most teachers had little experience in the use of IVBs and very little in the integration of computers into classroom activities. Probably in the second period of research, with the completion of the 3 remaining seminars, the usage rates of these technological resources would increase in teaching and learning processes.

### 3.2. Types of activities most used in classrooms 2.0

During this first period of research, we gather in the more frequent uses of IVBs and computers along with their ratings. Initially, the most common types of activities are those that are focused on the teacher's activity and those that are developed with the IVB:

- Keynote addresses (95%).
- The carrying-out of group exercises (82%).
- Collective comments on information from the Internet, mainly videos or newspapers (80%).
- Class correction of exercises (68%).

Later, and progressively to a lesser extent, other types of activities are also carried out by students with the IVB:

- Presentation of papers and materials used in the work (68%).
- Presentation of information from Internet (62%).
- Explanation of items to classmates on the role of the teacher (62%).

In some cases, students have also previously used computers for work or for looking for resources, the most frequent activities requiring a more active student role being:

- Doing self-correcting exercises and exercises for further correction (52%).
- Development projects (41%).

Less common actions and with lower assessments are for the use of simulators and learning platforms (Moodle or similar), creating blogs and wikis, the use of WebQuests and videoconferencing.

### 3.3. Advantages of classrooms 2.0

During this first period of research, the teaching staff appreciates many advantages in using technological resources in teaching. The most important advantages that affect teaching and learning processes are:

- Increased attention and motivation (100%).
- Facilitating understanding (98%).
- Increased access to resources for debate and

sharing among students and/or teachers (92%).

- Facilitating the teaching, learning and achievement of objectives (90%).
- Increased student participation and involvement (88%).
- Facilitating the contextualisation of activities and diversity management (82%).

Also, positive feedback is collected on activities carried out with a more active student role. The most important activities are:

- Research (93%).
- Developing creativity (86%).
- Making group corrections (85%).
- Conducting collaborative activities (82%).

Additionally, the teaching staff values certain benefits that directly affect the teachers:

- Enables a refreshing of methodology (88%).
- Increasing satisfaction, motivation and self-esteem (87%).

To a lesser extent and with lower assessment rates, the teaching staff mentioned that continuous assessment and presentations are facilitated. In contrast, there is a neutral stance on whether time is better used in class or as to whether reflection and reasoning are nurtured.

### 3.4. Notable classroom 2.0 disadvantages

During this first period of the investigation, the routine use of technological resources (in teaching and learning processes) also has drawbacks for teachers, few but significant. The outstanding issues are:

- Needing more time to prepare their teaching (75%).
- Internet connection problems (65%).
- Software failures and problems with students' computers (37%).

### 3.5. Impact of classrooms 2.0 on student learning

During this first period of research, virtually all teachers (91%) and a majority of students (75%) believe learning is better with new ICT activities and they like to perform them. The majority of teachers insist that this represents a significant increase in work, but it is worth it for the learning improvements gained. However, students do not always improve their academic qualifications, as emphasized by almost half of teachers (46%).

The impact on learning improvement from ICT activities is analysed in various student profiles. In this case, it is stated that the greatest impact in improvement (84%) is seen in the students who progress normally, well or very well during the process of

teaching and learning. In contrast, the impact is lower (68%) on students who cannot keep up or who are not motivated.

Additionally, teachers notice an improvement in the acquisition of competence in processing information, digital competence and competence in learning to learn. To a lesser extent, they also identify improvements in linguistic communication skills, autonomy and personal initiative. Throughout the second period of research, how performing certain activities with ICT can make way for skills development was studied in depth.

#### 4. Conclusions and discussion

At the end of the experiment, the use of IWBs in teaching was greater than that of computers, almost double. The most frequent and highly-rated activities were those made with the IWB and those that focused on the work of teaching (keynote addresses, carrying-out of exercises, conceptualisation of Internet information and corrections). Next, also with good results, came other activities in which students make extensive use of the IWB (project presentations, explanations...). The fact that teachers start out using the IWB for teacher-centred activities and that they are initially the most common activities is considered in other research on IWBs (Marquès & Domingo, 2010; 2011).

At the end of the first period of research, there are several types of activities that students performed with computers, but to a lesser extent. The most common were self corrective exercises and exercises to correct, project development, consultations and works.

The classroom use of other resources of great educational potential such as simulators, educational platforms, blogs, wikis, WebQuests and videoconferencing was low. Probably, they will be used more and with better results as the skills and abilities of teachers increase in the teaching and technical use of these resources.

Obviously, the use of ICT in teaching still has significant drawbacks (devoting more time to prepare teaching and problems with Internet connection and computers), but there are significant advantages that

teachers expressed almost unanimously. The most significant advantages being:

- Increased attention, motivation and student participation.
- Facilitating the understanding of issues, teaching, learning and the achievement of objectives.
- A refreshing of methodology.
- Increases in teacher satisfaction, motivation and self-esteem.

In addition, teaching staff appreciate that they now have more resources to use and share in class, more contextualized activities, can better manage diversity and provide more opportunities for research, collaborative efforts and corrections. They also underline the

**In addition, teaching staff appreciate that they now have more resources to use and share in class, more contextualized activities, can better manage diversity and provide more opportunities for research, collaborative efforts and corrections. They also underline the impact on the acquisition of certain skills such as digital literacy, processing information and learning to learn.**

impact on the acquisition of certain skills such as digital literacy, processing information and learning to learn. Together with these advantages, we note that the use of IWBs and / or computers (in teaching and learning) is a wise choice for use in today's classrooms. We further assert that perhaps these resources could be helpful in contributing to reducing academic failure.

Virtually all teachers and a majority of students believe that learning improved with the use of IWBs and / or computers in teaching and learning processes. However, students do not always improve their academic qualifications, as emphasized by almost half of teachers. Therefore, there is an inconsistency because the improvement in student learning is not reflected in their final assessment. Perhaps, the cause of this contradiction resides in that memorising still prevails in the assessment. In fact, the activities supported by IWBs and / or computers only benefit memorising contents long-term when specific programs are used for this purpose. Probably, if the assessment pro-

vided more learning competence, student grades would also be higher. Therefore, a significant challenge lies ahead to design reliable strategies for identifying and validating learning outcomes in the assessment.

We found that the use or incorporation of ICT in the classroom can provide a good opportunity to raise necessary issues about teaching and learning in 21st century schools (Adell, 2010a, 2010b; Domingo & Fuentes, 2010). In this investigation, the progressive considerations and experimentation have been complemented by an increase in new realities such as learning through teaching practice and active ICT experimentation.

We round up by underlining significant activities carried out since the seminars, which have eased the incorporation of ICT in the classroom:

- Contextualising teacher training that attends to their practical needs.
- Teachers exchanging experiences and sound practices.
- Providing opportunities for teachers to work together and with experts.
- Supporting and encouraging the testing of new strategies and skills.

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