Visual Stereotypes and Virtual Pedagogical Agents

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ABSTRACT
The paper deals with the use of visual stereotypes in virtual pedagogical agents and its potential impact in digital learning environments. An analysis of the concept of visual stereotypes is followed by a discussion of affordances and drawbacks as to their use in the context of traditional media. Next, the paper explores whether virtual pedagogical characters introduce anything novel with regard to the use of visual stereotypes – as compared both to real life interaction between humans and to the use of visual stereotypes in traditional non-interactive media such as magazines, film, television and video. It is proposed that novel affordances, as well as novel drawbacks, indeed are being introduced with the use of visual stereotypes in virtual characters. The conclusion of the paper is that knowledge on these matters can be useful both for developers of educational systems and for educators in enabling them to strengthen some pedagogical settings and activities.

Keywords
Pedagogical agent, Virtual character, Visual stereotype, Learning, Gender

Introduction
Virtual pedagogical agents, i.e. computer generated characters in pedagogical roles are entering the digital society in increasing numbers. They are found in educational programs, from preschool to university. They are also found in broader educational contexts in the roles of virtual medical counsellors, physical exercise coaches and guides on city homepages, and they also appear in edutainment and infotainment settings. Furthermore, virtual characters are essential ingredients in digital environments used by young people, such as (of course) games and edutainment applications as well as chat systems and mobile phone applications (e.g. imvu at http://www.imvu.com).

According to Moreno & Flowerday (2006), we see more and more frequently that effective multimedia lessons are combined with the presence of virtual pedagogical agents. It is a qualified guess that various forms of digital educational environments and systems will increasingly incorporate these characters – virtual instructors, learning companions, coaches, mentors, etc. – concurrently with tool-kits for designing characters becoming increasingly available and wide-spread.

Furthermore, in recent years there has been a growing focus on the social dimension of human interaction with virtual pedagogical agents, with a variety of social competences being simulated in various agents (Baylor & Kim, 2005; Bickmore & Cassell, 2005; Gulz, 2005; Hall et al., 2004; Johnson, 2003; Paiva et al., 2004). Behind this lies the influential framework of “computers as social actors” by Reeves & Nass (1996) based on extensive studies that show that people spontaneously apply social interpretations and conventions when interacting with computer-based media. This human disposition, it is argued by Reeves & Nass and many others, ought to be further exploited in computer system design in order to make interaction smoother and more satisfying.

In human-human social interaction the visual appearance of other people is known to play a central role, with profound effects on our attitudes as well as behaviour. On the one hand, there are dynamic visual aspects such as gestures, facial expressions and gaze. These are extensively researched within the agent community. On the other hand, there are static visual aspects such as body and face properties, skin, hair and haircut, clothes and attributes. In spite of their documented impact in human-human social interaction (Kalick,1988; McArthur, 1982), the static visual aspects – that we will focus on in this article – have been little attended to in research on virtual agents (Gulz & Haake, 2006a; Gulz & Haake, 2006b).
Particularly in interacting socially with unfamiliar others, humans exploit visual cues – static as well as dynamic – to form expectations for guiding the interaction. In drama theory the concept physical personality refers to the aspects of a drama character’s appearance that immediately produce an impression of personality and initiate a set of expectations and attitudes. Among those are many static visual aspects such as body shape, height, sex, race, face, hair, clothing, make-up and facial hair (Brahnam, 2001). In contrast to how these cues are immediately picked up in the encounter with another human being, the linear stream of spoken information is incredibly slow (even though, of course, some voice characteristics are also quickly picked up). Berscheid & Walster (1974) note that, “… our appearance telegraphs more information about us than we would care to reveal on a battery of personality inventories, intelligence tests, and character scales. From flame-coloured hair through flat feet, few aspects of appearance fail to provide kernels of folk insight into another’s nature.” (ibid., p. 159).

These categorization processes, in which we quickly form expectations on a person’s likely behaviour, attitudes, opinions, personality, manners, etc., rely heavily upon stereotypes – that is, ideas of “typical” representatives of certain human categories, where clusters of properties are ascribed to these categories and their representatives. Stereotype is one of the main concepts in this article, roughly standing for a culturally shared socio-cognitive schema that summarizes our beliefs of other people and acting as a default setting in social perception processes. Since our focus is on the visual static aspects of stereotypes, we will use the term visual stereotypes.

The objective of the article is to explore the use of visual stereotypes in virtual pedagogical agents and the potential impact of such use in educational technology with respect to teaching and learning. First, we ask to what extent affordances and drawbacks found in the use of visual stereotypes in real life interaction and in traditional media, reappear when used in virtual agents. In an attempt to answer this question, we also present and discuss some of the (few) empirical studies carried out in the area. Second, we analyse in what ways interaction with virtual pedagogical characters introduces something novel with respect to the use of visual stereotypes, both in terms of affordances and drawbacks. Before entering these two issues, we provide a background by analysing the concept of visual stereotype, relating it to the concept of visual prototype, and discussing visual stereotyping with respect to visual naturalism versus visual stylisation.

The concept of visual stereotype

Figure 1 presents four examples of visual stereotypes. Many observers will in these pictures see a teenager (1a), a housewife (1b), a craftsman (1c), and an air-hostess (1d). A visual stereotype, in our sense of the term, consists of a number of visual attributes in a person that will make a majority of observers perceive the person as an illustration, or a typical instance, of a human group, a professional group, a social group, etc. That is, the visual input activates expectations on other – not visible – attributes in the person: how he/she is likely to behave and to talk, what he/she can be expected to say or not say, what attitudes and opinions he/she will be likely to have, etc. In this way visual cues carry social baggage.

Figure 1. Examples of visual stereotypes
Gender is often an important aspect of visual stereotypes. A “typical craftsman” is a man, whereas a “typical air hostess” is a woman (see Figure 1). Furthermore, a representation of a “typical scientist” is at the same time also a representation of a “typical male scientist”, whereas a “typical female scientist” is a stereotype of its own. Correspondingly, the visual stereotype of a “sweetie” concords with that of a “female sweetie”, whereas “male sweetie” is another and separate visual stereotype. Gender will be a recurring issue in this text.

Stereotypes and prototypes

Within the cognitive sciences the concept prototype is used to stand for “a typical exemplar” of a concept. For example, an apple is a prototypical fruit whereas a kiwi is not, and a lawyer is a prototypical law person whereas an investigation secretary is not. Focusing on the visual aspects, one may also speak of visual prototypes in parallel to visual stereotypes.

In the context of this article, an interesting difference between the concepts is that a (visual) prototype is something neutral, whereas a (visual) stereotype brings along negative associations (Schneider, 2003). A picture or description of a prototypical youngster, a prototypical nurse or a prototypical beauty is not necessarily something negative. The presumed basis for a certain exemplar being prototypical is the frequency of occurrences in human perceptions and experiences, and in that sense a prototype relates to something “really there”. A stereotype, on the other hand, is often associated with something that culture, media, etc. has constructed out of dubious starting points but where there is not something “really there”. (A complicating factor, that blurs the distinction just given, is of course that media constitutes an important part of our perceptions and experiences).

We will in the following use the term visual stereotype but attempt to assign to it some of the neutrality from the term prototype. Our purpose is, namely, to study the use of visual stereotypes from two angles and look for positive affordances as well as drawbacks. Thus, we are not assuming that the use of visual stereotypes is necessarily evil, unjustified or to be combated. (Actually, it was not until the 19th century that the word stereotype — originating from the Greek words stereos for “solid” and typos for “a model” — became linked to prejudice and discrimination (cf. Schneider, 2003).)

As to the bases of visual stereotypes, our standpoint is that it is a heterogeneous phenomenon. For some visual stereotypes the expression “no smoke without fire” applies. Culture and media may reinforce and exaggerate them, but there is “something there” behind the visual stereotypes. For instance, a punk look indeed often goes along with an individualistic attitude and a desire to be allowed to go one’s own way and not be forced to follow established societal norms. In the case of other visual stereotypes, the world has changed substantially compared to the situation from which they originate, and there is no or very little accuracy in them today: e.g. the personality and behavioural habits of the eccentric British explorer in his Khaki shorts, short-sleeved shirt, pith helmet, and brown shoes. Yet other visual stereotypes were from the start pure constructions. The “stupid blonde” stereotype is one such example. It certainly is not, nor has ever been, the case that blonde women (or men) on the average are stupider than non-blondes.

Stylised visual stereotypes

Visual stereotypes can appear in many different media formats: photos, movies, paintings, drawings, comics, animated movies, etc. Some of these formats allow different degrees of visual naturalism, which in the context of stereotypes is a feature of interest. There is a whole scale from photorealism on the one hand to pronounced stylisation on the other, e.g. a cartoonish style or other artistic style that modifies and often simplifies a person’s appearance (Gulz & Haake, 2006b).

Stylisation makes it possible to sharpen and exaggerate a visual stereotype (see Figure 2). Such amplified visual stereotyping via stylisation is foremost associated with graphical media, such as cartoons and animated movies. But it is also used in theatre, where the shaping of characters sometimes makes extensive use of visual stereotypes. Heavy make-up and large distance to the stage can, furthermore, reinforce the appearance of the artists on the stage as visually stereotyped. In Commedia dell’Arte and classical Chinese opera, for example, dresses and make-up as well as gestures are pronouncedly stylised (see Figure 3). Also movies can rely upon stylised visual stereotyping. As
an example, Indiana Jones (Figure 3) wears throughout all three movies more or less the same outfit, characterized by his fedora, leather jacket, unbuttoned shirt and bullwhip, which function as immediate cues for identification. Likewise, it is often easy in movies to predict the roles of characters and who is going to die or survive on the basis of the visual stereotyping.

![Visual stereotypes: naturalism versus stylization](image)

**Figure 2.** Visual stereotypes: naturalism versus stylization

![Visual stereotypes](image)

**Figure 3.** Left: Harlequin (Commedia dell’Arte), middle: Chinese opera actor, and right: Indiana Jones (actor Harrison Ford)

**Visual stereotypes in traditional media characters as well as in virtual characters**

**Visual stereotypes – affordances**

Visual stereotypes are an important aspect of human thinking in their function as cognitive short cuts for making action and life tractable for human beings. Instead of becoming overwhelmingly occupied with thoughts and questions about people that we encounter we make use of their visual appearance to situate them, in order to focus on interaction as such (Brewer, 1988). That is, visual stereotypes frame our expectations. They are also used for building common references in conversations about other people. In brief, they are part of our social autopilot as an essential navigation tool in a social environment that would otherwise be overwhelmingly complex and demand a practically insurmountable burden of processing (Smith & Medin, 1981). Notably we speak here of very quick and largely unconscious processes.

If we start out to consider traditional visual media – theatre, film, comics – it is indeed essential that a reader or a spectator is scaffolded to gain an idea of the characters (their personalities, habits, manners, opinions,
predispositions, etc.). Without such starting points for entering the story, many plots would simply not be possible to follow. And here, as Laurel (1993) points out in discussing theatre, the visual appearance of characters can be used to suggest the internal traits of the character in order to function as shorthand for understanding and predicting the character. As mentioned above, some forms of theatre indeed drive this very far.

Consequently, a parallel use of visual stereotypes in character-based digital learning environments may provide starting points both for the interpretation of the virtual characters and for the interaction with them. Adequate starting points unleash resources to focus on the content of the interaction, afford smoother interaction and may generate a greater sense of enjoyment and accomplishment in users. This line of thought is indeed reflected in the many design recommendations or guidelines for virtual characters (as well as for traditional media characters), that underline the importance of consistency between features such as voice, gender, looks and role of a character (Nass et al., 2000). Inconsistencies engender disturbance and distraction, which increase the demand on cognitive resources. On the other hand, with a visual appearance that corresponds to behaviour and personality predictions, users get their expectations acknowledged and leveraged, and interaction becomes smooth and efficient.

However, choosing an adequate visual stereotype can be difficult as exemplified by the following three examples. In the first example, provided by de Rosis et al. (2004), a virtual character was to be designed for a digital legal information system in Italy. Initially the virtual character was modelled upon a very attractive young female assistant, since the developers assumed that the typical user of their system was going to be a male lawyer. However, after realizing that the lawyer’s (female) secretary was the one who most frequently used the system, the designers became aware that the appearance and behaviour of the virtual character disturbed these users, and designed a new character with a more professional communication style and more classical attire. The point is that the first visual stereotype, the young attractive female secretary character, was not an adequate starting point for the users of the system – but instead disturbed and distracted them. Furthermore, visual redesign was indeed required. It would not have been sufficient to redesign the dialogue and behaviour of the character but leave the visual appearance intact.

A second example involves two different design cases of virtual assistants for city home pages. In Botkyrka, a Swedish community with a high percentage of immigrants, a stereotypically “Swedish-looking” light-blond female character was introduced as a virtual assistant on the website. However, due to negative comments from site visitors the character was removed and redesigned. This virtual character turned out not to be an adequate visual starting point for a visitor entering the site and its content. (In this case the content with its structure and pedagogical design may be perfectly well-designed but nevertheless of no benefit for visitors.) In contrast, in the Swedish city of Malmö, equally with a high percentage of immigrants, the character Sara (Figure 4) was chosen. In this character, stereotypical ethnicity attributes as well as stereotypical gender attributes, were treated carefully. Notably, the discussions underlying the visual design of the Sara character were extensive.

A third example is provided by Baylor’s research group at Research of innovative technology for learning (RITL). Within a programme for gender equity in science and engineering, Baylor directs the project Challenging Stereotypes toward Engineering with Pedagogical Agents. The project investigates, among other things, the influence of character appearance on female choice of engineering subjects. Several empirical studies within the project pointed in the same direction. Young female students were more strongly affected, as to their motivation and self-efficacy regarding engineering subjects, by virtual coaches that were similar to themselves or similar to how
they would like to be – in this case female, young and cool (Figure 5, left). Using such characters as coaches and instructors in tutorials on technology also seemed to increase the willingness of female students to select courses with technical content (Baylor, 2005). However, in an additional study (Baylor & Rosenberg-Kima, 2006) it was seen that even though, again, female students who interacted with a peer model character (female, young and cool) showed a more positive view of, and attitude towards, “an engineer”, the outcome was different as to influences on their attitudes regarding the importance and utility of engineering-related fields. Here the young female students were significantly more influenced by a male, older, un-cool “stereotypical engineer” character (Figure 5, right). The researchers tentative conclusion is that perhaps the “… most effective approach would be to use multiple agents (e.g., have a stereotypical engineer and a peer model both interact with participants).” (ibid., p. 6).

![Figure 5. Virtual coaches from (Baylor & Rosenberg-Kima, 2006)](image)

However, even if visual design choices can be difficult to make, we think it is important that educational systems developers acknowledge the influences of visual design, and in particular visual stereotypes. This may not come easily. Traditionally, computer science related domains have not acknowledged visual design as important in relation to the “real thing” which is the computer systems behind the – visually designed – interface. Of course the system must be wrapped up and presented in some way, but basically the system stands for itself. For virtual pedagogical agents, specifically, the argument goes that what really matters is the behaviour, the dialogue, the movements, the facial expressions and the pedagogical role of such an agent (Gulz & Haake, 2006a). The quality of these aspects determine to what extent the pedagogical goals set for the agent will be fulfilled. Then, indeed, the character needs to have a visual look or appearance – a skin colour a hair-cut, a body (shape), some clothing, etc. – but these are considered surface aspects with no real impact on the fulfilment pedagogical goals of the agent or of the learning environment that it inhabits.

This way of reasoning, we argue, is mistaken. On the one hand, it certainly is the case that without the development and refinement of algorithms and modules of behaviour, dialogue and pedagogy there would be no virtual pedagogical agents at all. On the other hand, no matter how adequate and well designed these fundamental aspects are – if the agent’s visual appearance is inadequate, the pedagogical benefits may decrease considerably. By now there is substantial evidence that learners’ expectations, attitudes, understanding and motivation in various ways are affected by the visual design of a virtual pedagogical agent. It may influence the following: learners’ beliefs in their own competence in approaching a certain subject matter, their willingness to pay attention to a presentation or tutorial, the extent to which they find something trustworthy or relevant, how hard they try to understand a material, and so on (Baylor & Plant, 2005; Graesser et al., 2004; Gulz et al., 2007b; Massaro, 2004; Moreno et al., 2001).

Furthermore, this does not refer only to “certain rare cases”, which involve explicit or apparent visual stereotypes. Stereotypes and stereotypical elements are pervasive in human cognition, and features such as gender, age, ethnicity, clothing, etc., must be decided on in almost all cases of a virtual character. After a series of studies involving such visual elements, Moreno & Flowerday (2006) argue that the choice of an agent’s visual appearance is practically always psychologically loaded, and put this empirically based conclusion in contrast to how “… the vast majority of instructional interfaces assign arbitrary animated pedagogical agents assuming that the choice of an agent representation is psychologically neutral.” (ibid., p. 191).

Even subtle cues as to visual stereotypes can influence learners’ experiences and the way they assimilate a given content in a digital context. This is shown, for instance, in (Gulz et al., 2007a) that presents a parallel study to one by Voelker (1994) and also described in Reeves & Nass (1996). The Voelker (1994) study compared user evaluations of
two female presenters, where one spoke in a more stereotypically feminine voice than the other. Results were that the presenter with the more feminine voice, and thus also the content of her presentation, was evaluated significantly lower on trustworthiness and intelligence, but significantly higher on warmth and empathy. In other words, relatively subtle voice cues evoked evaluations in line with well-known gender stereotypes. The present study (Gulz et al., 2007a) instead manipulated the degree of femininity of female virtual characters via visual cues. One character was designed as more (stereo)typically feminine and the other character as less (stereo)typically feminine by varying visual cues as to degree of femininity (shape of head, hairstyle and makeup) (Figure 6). The characters were also pre-validated in order to make sure that they were indeed perceived in this way. Regarding non-visual cues, both characters were identical as to their professional role as medical doctors, their voices and their lecturing on shift work and health. Again, the visual cues as to the degree of femininity influenced users’ evaluation of the characters, and thus the content of their lectures, in accordance with gender stereotypes.

![Figure 6. Virtual characters (presenters) from Gulz et al. (2007a)](image)

It is important to remember that when asked, most people deny that one or another visual stereotype cue could make any difference for how they experience a presented material or for their attentiveness, etc. When told that this is the case, it can still be hard to believe or admit, possibly because it does not fit with the concept of human beings as rational and capable of identifying good content regardless of its form. Nevertheless, empirical evidence shows that we are all sensitive to visual stereotypes in the sense that on an unconscious cognitive level they influence our judgments and interpretations of informational settings that we encounter (Cook, 1979). Those involved in designing educational material and in teaching can profit from acknowledging and learning more about the mechanisms and processes involved.

**Visual stereotypes – drawbacks**

A visual stereotype may – by its nature – activate misleading expectations. Even if based on some kind of frequency distributions of property-clusters in peoples’ experiences and thus corresponding to “actuality” in a statistical sense (i.e. a prototype), a visual stereotype can in a given instance be inadequate and misleading. In real life an example could be a youngster whose street fashion look signals “tough, rebellious and cheeky” but who actually is very kind and helpful.

Correspondingly, a badly casted visual stereotype for a film character or a comic character – when not an intentional choice by the producers – may confuse and irritate users, and induce an impression of a non-believable and un-professionally staged character. Consider all the fuss around the choice of James Bond actors, where some last for only one production, while others reappear again and again and become more or less synonymous to the role. Even though there are many different variables involved, the visual appearances play an important role in these outcomes.

For the case of interactive media, consider the Botkyrka example reported above, where the chosen visual stereotype of a “very Swedish-looking” women, activated undesired and misleading expectations as to the aim and use of the city home page (which was to welcome and invite everyone to use it, and to boost inhabitants’ feelings of belonging to the city in question.)

Another important drawback is that visual stereotypes may be perceived to represent the normal, and make visual appearances that diverge from the stereotype be perceived as odd, unusual, or even abnormal. For instance, a
spectacled and somewhat thin craftsman is “no real craftsman”. In this way, visual stereotypes can hide or suppress nuances and an existing manifold. There is also the aspect of self-reproduction and self-reinforcing of stereotypes due to the close interactions between media and “real life. Societally undesirable gender stereotypes of a normative kind are frequent in traditional non-interactive media, and can be observed in the case of virtual characters as well. For instance, many computer game characters reproduce visual stereotypes. In 1998 it was concluded in the Next Generation Magazine that despite dramatic increases in the number of female game characters, “… they all seem to be constructed around very simple aesthetic stereotypes. In the East, it’s all giggling schoolgirls and sailor uniforms, but in the West the recipe appears to be bee-sting lips, a micro-thin waist, and voluminous, pneumatic breasts.” (Next Generation, 1998, p. 8). And even though there has been some change, overall there is still truth in this analysis. From more recent discussion forums one can learn that some female gamers refuse to play female characters and feel insulted by how they are designed, and also that some male gamers are unsatisfied with the masculine stereotypes presented (visually and otherwise): “I usually play as female characters, because male characters are always hyper-masculine and that’s not how I feel. However, if there’s a feminine guy, I WILL choose him.” (GameGirlAdvance, 2004).

In sum, we have discussed a number of advantages and drawbacks with the use of visual stereotypes, where what is known from traditional media reappears in the virtual world. We now proceed towards what virtual characters bring in as novel.

**Novel affordances and risks with virtual characters and visual stereotypes**

**Introducing novel possibilities**

All sets of visual cues that can appear in real human beings, or in photos and films of real humans, can also appear in a virtual agent. Thus, all visual stereotypes that can be seen in live human beings or in traditional media portraying humans can also be reproduced in virtual characters. But there are additional possibilities in virtual characters due to the extended degrees of freedom regarding visual modelling. In virtual characters it is easy to “cut and mix” and arrive at combinations that do not occur, or rarely so, in real human beings. Thus, it is relatively easy to challenge, or break down, visual stereotypes: to combine visual elements from different stereotypes or to combine a given visual stereotype with an unusual role.

It can be argued that such playing around with visual stereotypes is just as possible in other graphical media, such as comics and animated movies. Nevertheless it seems that in practice interactive media has brought this out more extensively. While traditional graphical media relies on the observer or reader as a passive consumer of pre-designed stereotypes, the interactive virtual arena activates the participants. In the area of computer gaming, we find communities where players themselves contribute to the design and development of characters. Here a remarkable character diversity can be observed. As to gender, several new appearances of female heroines, androgynous characters and other kinds of in-betweens have come into existence (Schleiner, 2000).

This points towards the potential of using virtual pedagogical characters as visual stereotype busters, to present the non-standardized and expose a manifold in combinations of ethnicity, professional roles, social classes, gender, and so on. Figure 7 shows some avatars from the on-line world Second Life (http://secondlife.com), of which some are used to explore alternative gender and personality.

![Figure 7. Avatars from Second Life](http://secondlife.com)
Offering a broader range of styles and identities may, furthermore, enable social identification and role modelling for a larger number of students. In turn, identification and opportunities for role modelling are known to strengthen development in pedagogical terms (Bandura, 1977). Here we can have dynamic, interactive situations, involving exploration and feedback that are not possible in traditional, non-interactive media. An example outside of education in a narrower sense, but belonging to the broader pedagogical domain, is a virtual character system for young women with eating disorders. The virtual coach character in question will start out looking really thin – in order for the clients to identify with, find trustworthy and be inclined to interact with – but then over time transform visually towards a more normal weight young female. In this sense, by slowly manipulating he stereotype, it may be possible to help the client to get away from an unhealthy mental visual stereotype.

But apart from the situation where developers may design virtual characters visually in a knowledgeable way in order to reach certain educational and pedagogical goals, one can also imagine the situation where learners themselves get to design their virtual instructors or learning companions. Where they, themselves or in a group, decide on the ethnicity, gender, body shape, clothing style, etc. for a virtual pedagogical character inhabiting a certain digital learning environment. “What is this instructor going to look like? Who is it going to be?” – Such a situation will be familiar for many young people used to games such as the Sims, avatars in on-line chats, etc. Furthermore, this situation can be set up both through commercial educational systems that provide character design kits, and through digital learning materials put together from scratch by teachers and students themselves, using character toolkits already becoming available (e.g. PeoplePutty at http://www.haptek.com/peopleputty and Meez at http://www.meez.com).

In both kinds of situations, a human pedagogue with knowledge of the impact of visual stereotypes will have an opportunity to use the situation as a basis for reflection and discussion: Why do we choose this character in this role – coach, learning companion, instructor, for different subject domains? Whose appearance shall be exhibited, in terms of gender, age, ethnicity, class, regional subgroup, etc? (Voice, in terms of gender, dialect and sociolect is another design feature that one will probably be able to choose). Which visual features do we find easy to combine and which not? What can be lost and what can be gained by choosing/designing a less naturalistic character?

Various alternatives may be suggested and explored. We believe that this kind of active and dynamic situation can provide a natural and powerful basis for reflection and discussion – more so than a standard and often more disconnected classroom discussion on stereotypes. This could be a rich and flexible tool for a pedagogue interested in challenging prejudices and proposing reconstruction of roles. Since humans are perceptual creatures and are powerfully affected by perceptual input and materials, this can be a vigorous complement to attempts at verbal reconstruction.

**Dilemmas with novel possibilities**

The idea of breaking with visual stereotypes for pedagogical purposes that we have repeatedly lifted forth can, however, be in conflict with the pedagogical exploiting of visual stereotypes to facilitate smooth and efficient interaction. As observed earlier in the text, the use of visual stereotypes may enable learners to interact more smoothly with a character by acknowledging and leveraging learners’ expectations. In this way, the learner can focus on the learning activities and materials in question, rather than being confused and distracted by unexpected features and behaviour in a character.

The goal of smooth and efficient communication is central in the virtual agent research domain. In light of this, it is intelligible that Moreno et al. (2002) highlight the aim of obtaining “pedagogically effective animated agents” and the question of the “… role that stereotypic information [in the sense of visual stereotypes] plays in facilitating or inhibiting learning from animated agents.” (ibid., p. 4). Nevertheless, there is a striking lack of problematizing the issues and the results of their study, which indicate that participants learn significantly more from the male virtual tutors on the subject of blood pressure than from the female virtual tutors. The proposed explanation for this outcome goes that “… the female tutor broke with rules of etiquette about who should teach at a college level by not conforming to the stereotype of males as professors.” (ibid., p. 4), and is then left without further comment. That is, there is no mentioning of a conflict between, on the one hand, a wish to exploit the male professor stereotype in order to “facilitate learning from animated agents” and, on the other hand, a wish not to further reinforce the notion of the
male professor as the norm by using this stereotype. Likewise, the authors, without further comments, pose the question: “... do people learn more effectively about car repair from an agent named Joe who wears greasy overalls, or can they learn just as effectively about this topic from an agent named Nancy in a pink apron?” (ibid., p. 4). Compare Figure 8 showing an extract from the Joe Doe instruction series for US Army, drawn during the Second World War by Will Eisner.

![Figure 8. Joe Dope (by Will Eisner)](image)

In contrast to the Moreno et al. (2002) study, the complexity and hidden dilemmas in the use of visual stereotypes come forth clearly in the work of Baylor and her group at RITL. As related above, Baylor and collaborators have demonstrated (Baylor, 2005) that the use of virtual pedagogical coaches portrayed as young and attractive females can increase the willingness of female students to apply for technical education and to help increase their self-efficacy thanks to pedagogical processes such as role modelling and identification (cf. Bandura, 1977). The students find it easier to match these coaches compared to virtual coaches that are “typical, male, engineers”, with their own personal identity. However a detailed analysis of the results indicate that the increase in self-efficacy at least partly stems from a conception of such an engineer – female, feminine, young and attractive – as less competent than a “real”, prototypical, male engineer. What, according to the author, seems to occur is that the prejudice of females, and most of all feminine females, as less competent in technical domains spills over to the virtual area, generating increased self-efficacy of the kind “If she is able to do it, I can do it!”. Now, this implies a potential conflict between a short-term pedagogical goal of recruitment and boosted self-efficacy in female students, and a long-term pedagogical goal of changing rather than reproducing gender prejudices and stereotypes. As Baylor (2005) remarks, prejudices about less competent female – especially feminine female – engineers are not ones that one would like to reinforce and disseminate.

Summing up, there is a need to handle dilemmas in which, on the one hand, the use of a visual stereotype can contribute to efficient communication in a pedagogical situation by leveraging users’ expectations but where, on the other hand, the breaking with the stereotype can be desirable from a societal and long term pedagogical perspective. Likewise, there is a need to handle dilemmas where the breaking of a visual stereotype may have positive effects on attitudes as well as learning, but at the same time produce or reinforce questionable conceptions, such as the “female engineers are less capable” conception reported above.

**Introducing novel risks**

As to the detrimental normative function of visual stereotypes discussed in a previous section, the extended degrees of design freedom offered in the virtual world brings about additional risks. The construction and promotion of idealized super people with “perfect” bodies and looks (and even lives) has long since been abounding in non-interactive media such as television, video and magazines. Figure 9 (right) shows the femme fatal P’Gell in Will
Eisner’s comic *Spirit*. In this sense there is not much new under the sun, when interactive computer media continues this portraying of the ideal by promoting stereotypic instances never found in real life, such as the big-breasted, wasp-waisted action heroine *Lara Croft* (Figure 9, left): a biological contradiction whose tiny abdomen could hardly house all her vital organs, particularly if she also is to perform spectacular stunts and engage in violent fighting rather than fainting like corseted females of the 19\textsuperscript{th} century.

Nevertheless – this portrayal of the ideal can be taken *one step further* with interactive computer media. A key difference lies in what is otherwise seen as a central potential of virtual characters – not the least in pedagogical terms – namely their *interactivity*: Virtual characters may communicate, respond, and answer, thus establishing a dynamic, mutual social relation. A possible effect of this is that the distance between users or learners and these “ideal super people” is diminished. Until now we have watched, and read about, fabulous, good-looking people in movies and magazines (cf. P’Gell in Figure 9, right). If we are also to actively interact with them – in an era already desperately pursuing perfection in appearance – this might have detrimental effects on peoples self image and self esteem, as the interactivity may blur the distinction between “artefact” and “reality”.

Another related risk is the fact that virtual worlds involve users in a more active way than traditional movies and printed material. You can participate in various activities, including simulated everyday activities (c.f. *Second Life* at http://secondlife.com or *Entropia Universe* at http://www.entropiauniverse.com), and these activities may go on and on – there is no ending, as in the movie or book. This increases the risk (or potential) for users to indeed enter into “another world” with its characters and, in absorption, leave much of reality behind. The addiction risk is apparent. Extensive and absorbing interaction with stereotypical characters may have negative consequences for peoples’ conceptions of real people and real social life.

**Conclusion**

Positive and negative effects of visual stereotypes known from real life interaction and from traditional visual media reappear in interactive media. For instance, there is the invaluable function of visual stereotypes as cognitive tools for handling a complex social environment, as well as their problematic normative function that can make what diverges from a visual stereotype be perceived odd or abnormal.

But there are also *novel* possibilities and risks introduced by visual stereotypes in virtual agents. We have emphasized the extended possibilities to challenge visual stereotypes for educational purposes. Specifically we have highlighted the possibilities to provide social identification and role modelling for larger groups of learners. Rightly used, we think, virtual pedagogical agents can be a tool for supporting the exploration and formation of identity in
(young) learners while problemizing the reproduction of “undesired” (visual) stereotypes. Furthermore, it can be a pedagogical tool for initiating discussion and reflection on the role and the effects of visual stereotypes.

As to risks introduced by visual stereotypes in virtual agents, we have pointed at the replenished risks that follow from users interacting with, and perhaps being absorbed with, (visually) idealized stereotypes. The greater the knowledge about these issues among designers of digital learning material, the better the chance to counter these risks.

Summing up, we hold that the degrees of freedom as to visual design in digital virtual media, compared both to real life and to traditional media, imply an increased need for knowledge in order to navigate the design space in a thoughtful way. In products that are not directly commercial one may certainly wish that the visual designs of virtual pedagogical agents be based on informed design decisions.

Design guidelines

This is a natural point to ask for design guidelines as a support for designers to produce adequate visual appearances for virtual pedagogical characters, and we indeed think that research results within the domain should be used to contribute to a “visual design guidelines project”. Such guidelines cannot, however, be step-by-step recipes on “how to visually design a virtual pedagogical agent”. The reason for this is that whether a visual design decision is adequate and appropriate will always depend also on the learning context, the learning goals and the group of learners in question. Yet guidelines in the form of pointers or topics and considerations to reflect upon in combination with good and bad examples are certainly both possible and desirable. Pointers suggesting that “this is a question that needs to be answered before doing a choice on this or that visual parameter” or that “these variables relate to each other” can support a designer’s navigation through the visual design space of virtual pedagogical agents.

Regarding visual stereotypes and expectations, there is also an overall design consideration and trade-off discussed earlier in the text that should be kept in mind. On the one hand, there are times when pedagogical benefits are gained by challenging pre-conceptions and pre-knowledge. On the other hand, there are times when there are pedagogical benefits in exploiting existing conceptions, expectations and preferences in students.

In sum

We began by analysing the use of visual stereotypes in traditional, non-interactive, media, and indeed, there is interesting research in the case of traditional media relating to this topic. However, we hold that the issues must be separately approached for interactive pedagogical media, since there are additional affordances, in positive and negative senses, in the case of interactive media. By this standpoint we disagree to some extent with Reeves & Nass (1996) who hold that traditional media, such as television, and new media, such as computers “…afford the same problems and opportunities of stereotyping.” (ibid., p. 170). We believe that certain novel problems as well as opportunities enter the scene with digital interactive media. And if academic research in the domain of virtual pedagogical agents keeps up with the technological and commercial development, there is a potential to take on some responsibility and to be proactive in channelling the development.

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References


