Social enrichment by virtual characters – differential benefits

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Abstract
It is frequently held forth, within the area of virtual pedagogical characters, that such characters are beneficial for learning as they strengthen the social dimension of electronic learning environments. This article presents more details on this proposal together with a survey of corresponding empirical evidence. In addition, materials from a recently conducted empirical study are presented. Ninety school children, 12–15-year-old, were asked (i) to grade the idea of virtual characters in electronic learning environments and (ii) to choose between a strictly task-oriented, socially ‘shallow’ and a more socially oriented pedagogical character. The participants were also asked to articulate the reasons behind their answers, and to share their thoughts and opinions on the issues. The results of the study, as well as of several of the studies reviewed, indicate that responses and attitudes towards social aspects of virtual pedagogical characters are highly divergent. In particular, the notion that social dimensions of virtual characters increase learners’ motivation and engagement may be less generally applicable in a student population than is sometimes hypothesized. An ensuing design guideline suggests interface solutions with an emphasis on flexibility regarding social orientation and communicative style in virtual characters.

Keywords
empirical, individual differences, pedagogical agents, relation oriented, secondary school students, strictly task-oriented, virtual characters

Background
Central pedagogical theories, in various ways influenced by Vygotsky, highlight the role that social aspects play for successful learning. They emphasize that knowledge is socially constructed and that learning essentially involves sharing and negotiation. From a cognitive science perspective, the rich ability to process various forms of social information, as well as the motivation to do so, are essential for human intelligence and existence (e.g. Donald 1991). Notably, human beings are not only able and motivated to handle the social environments that they themselves experience, but also represented social contexts, such as the more or less fictitious social environments in movies, novels, computer games, etc.

The social nature of human beings, thus described, has instructional implications. Attention must be paid to the social dimension of learning environments. In the case of electronic environments, the potential of virtual pedagogical characters in adding or developing a social dimension is frequently held forth (e.g. Kearsley 1993; Baylor 2001; Moreno et al. 2001; Dowling 2002; Bickmore 2003; Johnson et al. 2003).

Chou et al. (2003) state that the ‘positive impact of research on educational agents lies in its ability to strengthen the social learning environment’ (p. 260). Kim and Baylor (2005) argue that whereas traditional computer-based learning environments often failed to provide situated social interaction, this can now be
obtained through virtual pedagogical characters, which the authors define as ‘designed to facilitate learning through various pedagogical strategies emphasizing social interaction between learners and agents’ (p. 3).

This article sets out to present more details on how virtual agents may develop or strengthen the social dimension of computer-based learning environments and thereby lead to pedagogical benefits. The first part of the paper involves a literature survey of previous research. Proposed pedagogical benefits and corresponding empirical evidence is surveyed. The second part is a presentation of materials from a recently conducted empirical study. The overall goal is to add details to our current knowledge about user responses towards virtual pedagogical characters, specifically their social aspects.

**Proposed pedagogical benefits of social virtual characters**

The literature proposes a large number of pedagogical benefits that virtual characters can bring about (for an overview, see Gulz 2004). Here, the focus is on potential benefits associated with the social dimension that virtual characters may supply to electronic learning environments.

**Social capabilities in characters**

The addition of a virtual character or characters with human-like appearance and behaviour can, as such, be said to imply a development of the social dimension of an electronic learning environment. But the social ‘nature’ of a virtual character can be emphasized, when it is endowed with one, some or all of the following:

- a capability for socio-emotional expressions, such as empathy for an erring or frustrated learner; encouragement and praise, etc. (e.g. Lester et al. 2000; Johnson 2001; Baylor et al. 2005);
- a capacity to evoke emphatic reactions in learners (e.g. Hall et al. 2004; Paiva et al. 2004);
- an ability to apply social rules such as politeness in dialogue and interaction (e.g. Johnson 2003; Johnson et al. 2003; Wang et al. 2005);
- abilities for relation-oriented dialogue, including elements such as small talk, conversational story telling, joke telling/humour (e.g. Höök et al. 2000; Bickmore 2003);
- an ability to express a personality (e.g. André & Rist 2000; Ball & Breese 2000; Churchill et. al. 2000; Johnson 2001);
- a back story with personal attitudes, opinions, experiences, family life, etc. and an ability to refer to social personal issues (e.g. Höök et al. 2000; Marsella et al. 2000; Ovitt & Adams 2000);
- an ability for appropriate self-disclosure during a personal interview (e.g. Gong et al. 2001) and a capacity to use strategies of reciprocal self-disclosure that deepens over time (e.g. Bickmore et al. 2005);
- a capacity to remember and refer to earlier social interactions and to social (off-task) facts, such as what a learner has said about her favourite music, or about her plans for the week-end (Bickmore et al. 2005);
- a capacity to establish and maintain a relationship – a social bond – with the learner (e.g. Bickmore 2003; Bickmore et al. 2005);
- a capacity to evolve the relationship from stranger to friend (e.g. Bickmore et al. 2005);
- a capacity to track and evaluate the affective states of learners (e.g. Kort et al. 2001; Conati 2002; De Vicente & Pain 2002).

**Proposed pedagogical benefits**

In turn, such character capabilities are proposed to lead to pedagogical benefits, such as:

- learners relating to the character as a social and intellectual partner for collaborating, sharing ideas and perspectives, questioning, criticising, etc. (Ryokai et al. 2003);
- learners experiencing affiliation and identification with a pedagogical character, and the character functioning as a social role model (Ryokai et al. 2003; Baylor & Plant 2005);
- learners experiencing a material (or an electronic environment) as less difficult or intimidating.
(reduced anxiety in learners) (Johnson 2003; Baylor et al. 2004; Wang et al. 2005);
- a reduced level of frustration in learners (e.g. Baylor et al. 2005);
- increased self-efficacy in learners (Baylor & Kim 2005; Ryu & Baylor 2005; Wang et al. 2005);
- reduced loneliness in learners (e.g. Bickmore et al. 2005);
- learners experiencing a friendship relation with the character, with related effects such as a feeling of responsibility towards the character (Bickmore 2003; Burleson 2004; Bickmore et al. 2005) and increased support as well as criticism (Ryokai et al. 2003).

A highlighted pedagogical benefit: increased engagement and motivation

One potential benefit that is frequently pointed out is that, as the learning environment with the addition of pedagogical characters becomes more social, learner motivation and engagement will increase (e.g. André & Rist 2000; Lester et al. 2001; Moreno et al. 2001). Moundridou and Virvou (2002) hold forth animated pedagogical agents as a ‘promising approach to [the] challenging aims [of] how to guarantee effective learning, increase student’s motivation and engagement […] and generally enhance the learning experience’ (Moundridou and Virvou (2002, p. 253), emphasis added). Ryu and Baylor (2005) hold forth the ‘Engaging factor’ or ‘the positive social presence of the agent’ as it is ‘there’ for the learners and motivating them’ (p. 26). Johnson (2001) as well, underlines that agents can be used to improve subjective satisfaction and ‘make experiences captivating and exciting’ (p. 1).

It should be observed that, when motivational benefits are brought up, there is frequently a follow up argument. The motivating effects – gained from the social dimensions of character interaction – are proposed to affect learning outcomes in terms of improved understanding, memory, problem solving, etc (e.g. Lester et al., 2001; Moundridou & Virvou 2002; Johnson et al. 2003). If willing to spend more time with a system, André and Rist (2000) propose, a person possibly learns more about a subject matter. Moreno et al. (2001) suggest that a social agency environment built around an animated pedagogical agent will encourage learners to make a stronger effort to understand a material.

Pedagogical benefits of social virtual characters – empirical evidence

For most of the potential benefits listed above, the empirical evidence is limited. Few corresponding user studies have been carried out, and in several cases there are only single studies of pilot character addressing a particular potential benefit. But there are exceptions. Learner experiences of friendship relations with social virtual characters, and effects of this, have been studied by several researchers. Also, there is a good amount of empirical evidence concerning the notion that virtual characters can increase learner motivation and engagement as the environment becomes more social.

The studies related below deal with these phenomena, and regard user responses and attitudes towards virtual pedagogical characters equipped with one or some of the social capabilities listed above. Some studies involve a comparison – virtual character vs. human, character-based interface vs. non-character-based interface – and some do not.

Learners experiencing friendship relations with social virtual characters

Oviatt and Adams (2000) studied ten 6–10-year-olds interacting with characters in animal shapes in a program that teaches early elementary children about marine biology, and observed that children ‘often specifically mentioned that they liked ‘talking to the animals’, whom they viewed as ‘friends’ rather than parents or teachers’ (p. 340). The researchers also report other evidence for friendship relations: ‘children spoke directly to the animals using personal pronouns, and approximately one-third of all the content exchanged involved social questions initiated by the child about the animated character’s name, birthday, personal characteristics, friends, and family life’ (p. 339). Potentially related positive effects (feelings of responsibility towards the character, engaging with the character as an intellectual partner, etc.) were, however, not targeted in the study.

2And to some extent it may be argued, that such studies have to await the further development of social capabilities of virtual characters.
Ryokai et al. (2003) studied 28 five-year-old girls, where 14 played with props and told stories about these props together with the virtual peer Sam, whereas the other 14 did the same but without Sam. The ways that the children spoke to and looked at Sam indicate, according to the authors, that they related to Sam as if she was a real child. Furthermore, the children treated Sam as an intellectual and social partner: as a collaborator and facilitator and also as a peer that needed coaching.

Going to the other side of the age span, Bickmore et al. (2005) let 10 participants, aged 63–85, have the virtual coach Laura support them in the ambition to increase their physical activity by walking, where Laura incorporate several of the social abilities listed in a previous section. Eleven participants in the same age group made up a control group. This group obtained a standard physical activity intervention: they got pedometers and printed materials on the benefits of walking for exercise. Evaluating their ‘relationship with Laura’ on a scale ranging from stranger (1) to close friend (7), the mean in the first group was 6.8.\(^3\) Also their ratings of ‘friendliness of Laura’ and ‘trust in Laura’ resulted in means over 6 with 7 as a maximum. In the summary Bickmore et al. (2005) state, that Laura ‘was effective at establishing a social bond with most users’ (p. 3). Furthermore, they report (Bickmore et al. 2005) that several participants mentioned that they enjoyed the social dialog with Laura and would have liked the opportunity to chat more with her. These results are particularly interesting as the interaction span was as long as 2 months, and as many user comments about the relational dynamics suggest that the relationship and the interaction became more familiar and deepened over time. That participants developed a feeling of responsibility towards the character – which is a possible effect of a friendship relation – was also indicated by the results. However, contrary to Bickmore et al.’s expectations, there were no significant differences between the Laura group and the control group on experiences of loneliness.\(^4\)

In an earlier study (Bickmore 2003), with a previous version of Laura and 91 participants, mean age 25, the responses towards a (possible) relationship with Laura were considerably more divergent. They ranged from subjects’ stating that they felt that they had come to know Laura and no longer thought of her as a computer character, towards statements like ‘Laura is NOT a real person, and therefore I HAVE NO RELATION WHATSOEVER WITH HER!’ (p. 185)

Also Höök et al. (2000) report divergency in responses among 18 participants, aged 19–41. In an information system about films, the characters Agneta and Frida ‘sit’ on the desktop and watch the browser, as if watching television, and comment on what they see. The characters were designed to express ‘personality’, ‘attitudes’, and ‘inner lives’ (Höök et al. 2000), and to provide users with their ‘back story’ through comments that allude to their own everyday lives. Participants were asked whether the Agneta and Frida characters ‘feel like friends’ on a scale from 1 to 7, where 1 stands for ‘not at all’ and 7 for ‘very much’. Nine out of 18 participants gave ratings between 5 and 7, and 9 gave ratings of 4 or lower.

Hall et al. (2004), finally, worked with a character-based learning environment about bullying. Given that the learning content as such concerns social relations and friendships, socio-emotive experiences in the learners, such as empathy, are essential. In a group of 127 8- to 12-year-old school children the researchers found an overall positive response. The result was compared with that of the 95 adult participants that participated in the same study, where the authors conclude that the children had a clearly more positive attitude towards the system and characters and ‘were more likely to have an emphatic response and found the characters more realistic and true-to-life than adults’ (p. 604).

Social virtual characters increasing engagement and motivation in learners

The Ryokai et al. (2003) study supports the notion that virtual characters can increase engagement and motivation in learners. When comparing the group of children who interacted with Sam with those who interacted with a peer, those interacting with Sam both talked more about storytelling and were more fully engaged in storytelling-related collaboration.

Robertson et al. (2004) studied 60 twelve-year-old pupils use a program that assists children in writing a story. Half of the group used a version with an ani-

\(^3\) Seven answers are included in this means.

\(^4\) Neither were there any effects on exercise behaviour.
mated agent interface and the other half a version with a more traditional graphical user interface. Children who used the agent version indicated more strongly that they wanted to use the program again. However, the agent version did not, as a general effect, increase engagement in the sense of producing more user interaction with the program. Whereas this indeed seemed to be the case for girls, boys to the contrary tended to interact more with the non-agent version.

In the Höök et al.’s (2000) study the following motivational issues were assessed: Did users find that the characters made the situation nicer? Did they think that the characters were fun? Did the characters stimulate explorative behaviour? Did users want to use the system again? Results were that two-thirds of the 18 participants seemed to appreciate the characters and found them fun and nice. The remaining third expressed negative views about the characters, found them irritating or disturbing, and not fun. These participants also, not surprisingly, expressed comparatively little willingness to use the system again.

In a preference study by Gulz (2002) 36 participants, aged 23–59, were asked to choose between two interfaces to an information system about books. In one the information was organized around a number of virtual characters, equipped with a back story. The other interface involved no characters but instead a spatial structure (a park). Out of the 36 participants, 16 chose the interface with virtual characters, 18 chose the one without characters and two answered that they could not chose one. From the verbal motivations given, it appeared that the social aspect of the interface with characters was appreciated by some (e.g. ‘I chose it because it is more personal’, ‘I like that it is about people, individuals’, ‘I find a social context more stimulating to explore’, and ‘It’s more natural and easy for me to relate to the people than to the park’) and disliked by others (e.g. ‘I don’t want to know things about those people’ and ‘People only complicate things’).

Bickmore (2003) reports user studies with the character REA, a virtual realtor, in two versions. In one version REA uses social dialogue; in the other she is purely task-oriented and ‘sticks to the task’ of providing estate information. Bickmore observes that REA’s engaging in small talk, which is a central social feature in communication between humans, evokes strong – and diverging – reactions. Some subjects ‘reported liking the social dialogue aspects of the interaction: ‘It wasn’t just real estate talk, so I felt like it made her more human’ ‘... It sounds like she’s on your side when she says things are expensive’ (p. 84). Other subjects ‘...clearly did not like REA’s small talk at all. ‘... I come in and I shop and I get the hell out. She seemed to want to start a basis for understanding each other” (p. 85). Also Laura, mentioned above, came in the (Bickmore 2003) study in two versions, a ‘non-relational version’ and a ‘relational version’, where the latter models a number of verbal and non-verbal relational behaviours (e.g. an increase over time in frequency of smiles, coming closer, making gestures; engaging in small talk, and so on). Also in this case the relational features were very differently received. On the one hand, some participants gave appreciative comments such as ‘I like talking to Laura, especially those little conversations about school, weather, interests, etc. She’s very caring. Toward the end, I found myself looking forward to these fresh chats that pop up every now and then. They make Laura so much more like a real person’ (p. 184). Also, a number of participants reported that Laura motivated them to engage in their exercise tasks as they felt responsible towards Laura, e.g. ‘It sort of kept me motivated, because I always do more if I know I’m responsible to someone’ (p. 188). But on the other hand, there were subjects who did not find Laura motivating or engaging, stating e.g. that: ‘I’m dealing with computers all the time. So, I really cannot take her as a character when you talk about those emotional kinds of things’; ‘I didn’t really like Laura very much ... Actually, I liked all of the software except for the animated conversation thing’ (pp. 185–186.). Likewise some subjects pointed out Laura’s inability to make them feel guilty if they did not exercise (p. 188.).

In sum

Above, potential benefits of the social dimension created by virtual characters have been reviewed, primarily in terms of friendship relations between learner and character and in terms of motivational or engagement benefits. The picture that appears is quite disparate. In several cases, we find highly divergent user responses towards social features in characters. Furthermore, it is possible that some of the studies
referred to above harbour more variability than is revealed. Sometimes, what is presented is only an overall impression or a means, for instance in cases of group comparisons (character use vs. no character use; adults vs. children). But this leaves us ignorant about the details making up the means. Furthermore, a number of statements are given in terms such as ‘most’ or ‘some’ that leave the precise distributions open.

The motivation for the study to be presented below, was to go into some detail both quantitatively and qualitatively regarding (i) learner responses towards (the idea of) social virtual characters and (ii) learner responses towards different degrees of sociability or social orientation. For the latter, we were inspired by the two kinds of communicative styles used by Bickmore (2003) – termed ‘task condition’ vs. ‘social condition’ in REA, and ‘non-relational’ vs. ‘relational’ in Laura. But we wanted to do something that is not done in Bickmore’s studies, namely to let learners choose between these two communicative styles in a pedagogical character – strict task-orientation vs. task and relation-orientation – and to articulate their choices.

Participants in the study were school children, aged 12–15. One reason for this choice is our belief that there is a large potential for character-based learning environments in elementary school. Another reason is that the literature review above indicates that virtual social characters are generally more positively received in children, whereas a larger proportion of adults seem negative and sceptical towards virtual social characters. But – as pointed out – it is possible that there exists a hidden variability, and so, we were particularly interested in contributing details on the homogeneity/heterogeneity in children’s responses towards social aspects of virtual pedagogical characters.

Study

Method

Participants

Ninety 12–15-year-old school children, 48 girls and 42 boys, from a Swedish secondary school, took part in the study, which was organized in the context of their regular arts lesson. The students came from nine different classes, or more precisely half classes. Nearly all students in the groups participated. They seemed keen to participate, and sometimes organized a queuing system among themselves. All had some familiarity with pedagogical programs making use of virtual characters.

Materials and tasks

Two dummy versions of a scenario-based multimedia program for secondary school were developed for the study. In both versions the student takes the role of a journalist at a magazine, being sent on various missions to European countries in order to do article research. In the Instructor Version the student is guided by a virtual instructor. In the Companion Version, the student is accompanied on the missions by a virtual companion. Both dummies, created in Macromedia Director, include (i) an introduction where the program and a first mission is presented (see Fig. 1) and (ii) a module where the student shall choose an instructor agent or a companion agent, respectively, from eight different animated pedagogical agents (see Fig. 2).

The presentation of the first missions includes illustrations from Istanbul and traditional Turkish music. A male speaker voice tells about the mission and presents the students with their role as journalist. In the Instructor Version, furthermore, the students are told that there is a chief editor in London who will be their instructor. The chief editor will formulate the missions, orient the journalist (the student) and provide necessary information at critical stages. The journalist (the student) is at particular times to report back to the chief editor who will evaluate the reports and provide feedback on what is well done and what needs to be worked on. In the Companion Version, the student is, instead, told that there will be a companion journalist together with whom she or he will conduct the missions.

Upon completion of the introduction the speaker voice tells the students to chose which figure they want as instructor (Instructor Version) or companion (Companion Version). In both versions the same eight animated characters are simultaneously placed in an oval on the screen (see Fig. 2).5

5The instructor version and the companion version both, in turn, were realized in two visual formats – realistic visual style versus iconic visual style, as one focus of the study was user preferences as to visual style. The screen dump in Fig. 1 comes from the realistic style version.

6One issue in the study as a whole concerned the relation between preferred visual style – iconic or realistic, and preferred social style – strictly task-oriented or task- and relation-oriented. This is analyzed in Gulz and Haake (2005).
Procedure
The three experimental leaders\(^7\) presented themselves to the class as working with research on educational media for the future. Students were then told that they would be welcome to participate in a study. It was emphasized that the purpose was to listen to student opinions of various aspects of a program that they would be asked to try out, that it was not a test of them and that they were fully anonymous. The students were asked to come, one at a time, to a small room behind the classroom where the session took place. After welcoming participants and asking what grade they were in, they were asked to sit down at the computer, press start and then wait for further instructions from the program.

When the student had progressed through the program and reached the choice-of-character module came the session part that dealt with preferences as to the visual style of characters, and articulations of these preferences.\(^8\) Thereafter came the session part that is central for this article, namely the one that regards (i) attitudes towards virtual pedagogical characters as such and (ii) attitudes towards a strictly task-oriented character vs. a task- and relation-oriented character.

For assessing attitudes towards (social) virtual pedagogical characters as such, the students were first asked for their opinion on the idea of having virtual learning companions (virtual instructors) in educational programs like this. They were asked to mark their opinion on a 1–7 scale, where 1 stands for this being a very bad idea and 7 stands for this being a very good idea. After this they were asked the follow-up question of why they graded the idea as they did, and were invited to share their opinions and thoughts.

Thereafter the participants were presented with two scenarios: (i) a scenario with an instructor/companion that focuses strictly on the task at hand in an efficient way (ii) a scenario with an instructor/companion that apart from working on the tasks also attempts to develop a relationship with the participant: supplying information about him or herself, experiences, interests,

\(^7\)One ran the program and helped the student out; one observed choices and took notes; one conducted the interviews.

\(^8\)Reported in Gulz and Haake (2005).
etc. engaging in small talk and more personal kinds of discussions, and so on. Participants were then asked which of these two instructors/learning companions they would prefer to have in this or a similar program for use in school. Again there was a follow-up question of why they answered as they did, where they were invited to share their thoughts and opinions.

Finally, a learning style inventory was filled in. After completion, the participant was offered refreshment, debriefed and thanked for their valuable help. The total time for a session was on average 18 min.

Measures
The participants’ choices were noted by one of the experimental leaders during the session. The qualitative data, i.e. how participants articulated the reasons for their choices, were recorded and transcribed. The data were then analysed by one of the experimental leaders and a researcher not involved in the experimental design to see whether any patterns and themes that aligned with the focus of the study could be identified. The first-level coding was made independently by the two coders and consisted in grouping similar responses together, paying particular attention to content that related to social dimensions of virtual characters. Upon comparing the classifications made by the two coders, a few differences occurred. After discussing these, a joint result was arrived at. The second-level coding involved giving each group a summarizing label, e.g. ‘so that one doesn’t have to be alone’ or ‘characters are tiresome’ (see Figs 1 and 2).

The rationales for an open-ended questioning in contrast to a more structured procedure were (i) the explorative nature of the study and (ii) the ambition to create an informal and causal atmosphere where students would talk and associate freely.

Results
Virtual pedagogical characters – pros and cons
A majority (80%, n = 72) of the participants, 37 girls and 35 boys, declared a positive attitude towards the idea of

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Fig. 2 A screen dump of the module where the participant shall choose an instructor character or a companion character, respectively, from eight different animated pedagogical characters.

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9The exact wordings differed in details depending upon whether the student had been using the companion version or instructor version.
virtual characters in pedagogical programs (score 5, 6, and 7 on the Likert-scale where 7 stood for ‘this is a very good idea’ and 1 stood for ‘this is a very bad idea’).

A minority (20%, n = 18) of the participants, 11 girls and seven boys, gave lower scores (3 or 4 on the Likert-scale), where some expressed doubtfulness or negative attitudes towards virtual characters in pedagogical programs. No participants, however, used the lowest part of the scale (1 or 2 on the Likert-scale). Overall, a positive attitude was manifest in a majority (approx. 80%) of the participants, a result that is in concordance with the studies of Robertson et al. (2004) and Hall et al. (2004), related above.

The most common pro argument for a character (21 answers) was that a character makes it more fun and/or more interesting. Another common line of reasoning (11 answers) was that a character would be advantageous in a learning context, because one might get help from the character and might learn more. A third relatively common argument (seven answers) was that with a character one does not have to be alone.

Three types of arguments against virtual pedagogical characters came forth: a character is superfluous and unnecessary (four answers), a character makes things more complicated (four answers) and a character is tiresome (three answers).

The most common kinds of pro and con arguments, respectively, are presented and exemplified in Table 1. It can be observed that some of the comments relate to social aspects of virtual characters.

Preferred social style of character – strictly task-oriented vs. task- and relation-oriented

Fifty-three participants (31 girls and 22 boys) chose a task- and relation-oriented character, and 37 (17 girls and 20 boys) chose a strictly task-oriented character.

Seventeen participants motivated their choice of a task- and relation-oriented character in terms of it being more fun, nice or interesting, without developing the argument any further. Another 18 participants developed the argument: it is nicer and more fun with a socially rich character because you get to know the character better. Some explicitly spoke about the importance of personal relations and personal contact/connection. Eight participants motivated their preference for a task- and relation-oriented character in terms of this being more playful and easy-going. The task-oriented character, it was held, would make the task too serious and hard. Four participants, finally, motivated their preference for a task- and relation-oriented character in terms of what is normal/common. Two of those felt, that a task- and relation-oriented character is more interesting because it is ‘not so common’, whereas two found a task- and relation-oriented character ‘more normal and common’.

All arguments in favour of a strictly task-oriented character, notably, were negatively formulated, as arguments against a task- and relation-oriented character. The three most common categories of arguments, each occurring in seven instances, are related to one another. Seven participants held that a task- and relation-oriented character would be trying, tiresome and a nuisance. Another seven pointed at the risk of getting distracted by a task- and relation-oriented character, and a third group of seven participants spoke of a task- and relation-oriented character as one that does unnecessary or meaningless things instead of focusing on what is important. Finally, five participants held forth that the character is a computer character and not a human being and that they therefore do not want to be personal with it.

Two participants explicitly responded that the ideal would be to have both versions available to choose from: ‘Sometimes one would feel like talking more and chatting, but sometimes one would prefer a companion that is quiet and sticks to the task. The best I think would be if one could chose between companions that have different personalities’, ‘It depends, sometimes I would like one that is talkative and social, but sometimes I can’t stand that and want to be spared from it’.

Notable in both pro and con arguments are references to various social aspects; such as socio-emotional feelings of not being alone, of collaborating, of having a personal relation, of getting in touch personally – vs. a desire to be spared ‘listening to chatter’ and these ‘unnecessary and meaningless social things’.

Table 2 presents common arguments pro and con the two kinds of communicative style.

In summary, participants’ views on strictly task-oriented vs. task- and relation-oriented characters clearly diverged.

Limitations

In interpreting the results, a number of methodological limits should be observed.
The study session as such gives the participant only limited experience with a character-based learning environment, in the form of a relatively short exposure to a prototype program including an introduction about the program concept. As concerns the participant’s response towards communication style in characters, the study session only provides scenario descriptions of the two kinds of communicative style, but no actual encounters with implementations of them. Nevertheless, bearing these conditions in mind the results – in particular the nature and divergence of positive and negative responses towards social orientation in characters – are informative.

A more problematic limitation, in my opinion, is the contrast between the study situation in terms of ‘a break from the usual’ and an authentic learning activity, ‘for real’ in a school situation. I speculate that participants perhaps would be more likely to prefer a strictly task-oriented character before a task- and relation-oriented character in the context of a ‘serious’ learning task or other school activity that they want to complete and, possibly, ‘get done’ with. In order to test this, further investigations are required.

Furthermore, the study, as the majority of user studies regarding character-based learning environments, does not inform us about repeated use during a longer period of time. It is possible that the actual results involve a novelty effect. A positive attitude towards characters in general, as well as positive responses towards socially and relationally oriented characters, may be amplified due to such an effect.10 One of the central tasks for future research is to test this, further investigations are required.

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Table 1. Pros and cons for virtual pedagogical characters

<table>
<thead>
<tr>
<th>Arguments</th>
<th>Frequency13</th>
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<tbody>
<tr>
<td><strong>Pro virtual characters</strong></td>
<td></td>
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<tr>
<td>• It is more fun/more interesting</td>
<td>21</td>
</tr>
<tr>
<td>‘It’s much more fun than just the computer saying things’. ‘It’s more interesting, a character is more alive’. ‘It can be interesting to see how it reacts and behaves towards you’. ‘It adds something, it gets more fun’. ‘To have someone along makes it more interesting’. ‘It’s a really great idea, it’ll be more fun then’. ‘A character is more fun than text-boxes’. ‘Text-boxes are not that fun’. ‘It will engage more, because it becomes more alive’. ‘It’s good as well as entertaining’. ‘It is a good idea, it can be quite fun – but it depends on how the idea is realised’.</td>
<td></td>
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<tr>
<td>• You learn better that way/you get help</td>
<td>11</td>
</tr>
<tr>
<td>‘I think it’s good, I think you learn pretty much that way’. ‘It’s good to think that there is someone to help you out’. ‘Good to know who to turn to’. ‘It would be good to work together, and you could learn from it’. ‘If it’s a game where you are supposed to learn things, it is absolutely a great idea’. ‘Good, because then you also get help’. ‘Always when you play a game where you shall learn things, it’s good to have a figure by your side’.</td>
<td></td>
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<tr>
<td>• So that one doesn’t have to be alone</td>
<td>7</td>
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<tr>
<td>‘It’s good because then you don’t have to be alone as much’. ‘It’s a good idea because sometimes it’s boring to play alone’. ‘It is good, because then you feel that you have someone with you, it looks as a human being or what to say, ‘Pretty good; sometimes it is boring to play alone’. ‘Always when you play a game where you shall learn things, it’s good to have a figure by your side’.</td>
<td></td>
</tr>
<tr>
<td>• A character is better than only a voice/only text-boxes</td>
<td>5</td>
</tr>
<tr>
<td>‘It is better with a figure that talks to you than only a voice’. ‘A figure that talks instead of only a voice will create more of a whole’. ‘It’s better than only text-boxes’.</td>
<td></td>
</tr>
<tr>
<td><strong>Con virtual characters</strong></td>
<td></td>
</tr>
<tr>
<td>• Characters are superfluous and unnecessary</td>
<td>4</td>
</tr>
<tr>
<td>‘It is unnecessary’. ‘They really aren’t needed’</td>
<td></td>
</tr>
<tr>
<td>• Characters complicate things</td>
<td>4</td>
</tr>
<tr>
<td>‘Characters only complicate things’. ‘I don’t think they add anything, only make things more complicated’.</td>
<td></td>
</tr>
<tr>
<td>• Characters are tiresome</td>
<td>3</td>
</tr>
<tr>
<td>‘Such characters are tiresome’. ‘It seems tiresome, it’s easier if you’re allowed to do things yourself, it’ll probably only complain all the time’. ‘I usually get weary of such characters’.</td>
<td></td>
</tr>
</tbody>
</table>

13Frequency indicates the number of arguments within each category. Only kinds of arguments that occur more than once are included.
examine repeated use during extended periods of time (cf. Gulz 2004).11

However, there is reason to believe that the main result of the study, namely the demonstration of diverging attitudes towards strict task orientation vs. task and relation orientation, where we are not talking of minority groups of participants, will have some bearing also in ‘real’ school situations and in activities over time. The relative distribution of preferences will certainly vary, among other things because of the quality and design of particular implementations, but it seems unlikely that none of the identified divergence will reappear.

From a somewhat different angle, Batliner et al. (2005) carried out a study that corroborates the existence of diverging approaches in children towards to the social aspects of computational artefacts. In this study 81 children, aged 4–14, were allowed to freely interact with a Sony AIBO robot dog, and notably two distinctly different approaches towards the robot dog appeared. One group of children spontaneously

11It seems more likely that fully accomplished educational programs for commercial use will be intended for use over time.
approached it as an interaction partner and social partner, encouraging it, reprimanding it, mothering it, getting angry with it, and so on. Another group of children approached the dog as a sort of remote control tool, attempting to figure out how it could be manipulated. The central observation, however, is that both groups of children seemed to be engaged and stimulated by the activities that they undertook (A. Batliner, personal communication, July 2005).

Discussion

Sometimes it has been asked whether virtual characters are a good idea: do positive or negative learning effects dominate? Do learners find virtual characters engaging and invest socially and emotionally in them – or do they find them distracting as they imply an overload on working memory? (Moreno et al. 2001).

The evidence presented in this article suggests that it is more fruitful to ask what kinds of characters have positive/negative effects for which and how large groups of learners. Specifically the use of socially oriented characters, capable of social dialogue, of building relationships, of referring to personal issues, and so on, may constitute less of an overall pedagogical benefit than is sometimes proposed.

Something that stands out in the results of the presented study, namely, is the contrast between how socially oriented characters for some participants, indeed, seem engaging (‘It’s more fun to get in touch personally with it’, ‘It would be a stimulus, like having someone that might cheer you up when its dull’, ‘It would be interesting, I am always curious about humans inner lives’, ‘It gets more interesting if one gets to know the person’) whereas for others they seem all but engaging (‘It would be totally tiresome’, ‘I want to focus on the task, I want to be spared listening to other chatter’, ‘It’s so unnecessary and meaningless with these social things’).

The question is: even if increasingly high quality systems and characters of this kind are developed, will they be beneficial for all learners? My tentative answer is that, at least, the proposed benefits by social dimensions of virtual characters of increasing motivation and engagement\(^\text{12}\) is less general in a student population than is sometimes hypothesized. Therefore, one should be more considerate when it comes to the communicative style of pedagogical characters. Out from the results presented in this article, I would propose the following tentative design guidelines:

(i) Supply an adequate variety and flexibility in pedagogical characters with respect to communicative style, where users may choose for themselves.
(ii) Likewise, in products that use multiple characters (teams of characters, multiple agent systems, etc.) ensure an adequate diversity with respect to communicative style (cf. Hietala & Niemirepo 1998).

Because while it is true that human beings are social creatures and that it is crucial to develop the social dimensions of electronic learning environments, there is a simultaneous need to consider individual differences in learning with social interfaces. Opting for design solutions with an emphasis on flexibility in this aspect may increase the positive effects from character-based learning environments.

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\(^\text{12}\)And possible learning gains ensuing from this.


