

# How students perceive the gender and personality of a visually androgynous agent

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**Abstract.** This paper explores how students perceive the gender of a visually androgynous teachable agent, and if and how the perceived gender relates to the perceived personality traits of the agent. It is shown that the students' perception of the agent's gender was independent of their own gender. There were few significant differences in the perceived personality traits in relation to perceived gender. However, when looking at the perceived degree of gender, the traits of the agent were more positively rated by those students who perceived it as moderately gendered as compared to androgynous or strongly gendered.

**Keywords:** Visual gender, personality trait, androgynous, teachable agent.

## 1 Introduction

The gender of a virtual agent is an important design factor as it can affect attitude, behaviour and outcomes of interaction with such an agent. Using stereotypically female or male agents can positively affect the trustworthiness of the agent, the user's belief in his or her own competence, and/or the attitude towards the agent. On the other hand it can reinforce negative stereotypes and behaviour, for example stereotypical female agents are more prone to be subjected to abusive conversation [1, 2].

Virtual pedagogical agents is a domain where gendered agents can provide good role models, and female students have been shown to increase self-efficacy and attitude in mathematics [3] and engineering [4] as a result of interacting with female agents. However, the same study [4] that showed that a more peer-like (young, female, attractive) agent positively influenced female students' self-efficacy and willingness to enter technical education, also showed that the agent reinforced negative stereotypes, along the line of the non-typical female agent being an exception from the "typical male competent engineer" and "if she is able to do it, I can do it!".

An attempt to retain the positive effects of gendered agents but diminish the drawbacks of gender stereotypes is to use agents with more neutral or androgynous appearances. For instance, a study [5] showed that a more gender neutral agent evoked more positive attitudes on females than did a more stereotypical female agent. Our own previous studies [6] have shown that to perceive an agent as androgynous-looking does not mean that one does not assign a gender to the agent, and that regardless of gender, students showed a significant preference for the androgynous agent over the gendered

(female and male) agents. Based on these findings we chose to use an androgynous agent when we designed a new virtual learning environment. When tested in a pilot study we found that when the agent was perceived as a boy the students described it with more positive words compared to when it was perceived as a girl [7]. Building on this we have conducted a study to explore: “What gender do the students perceive the agent to have, and does this differ depending on the student’s own gender?” and “Do the perceived personality traits of the agent differ depending on the perceived gender and/or the gender of the students?”

## 2 Study

“The Guardian of History” is an educational software for history for ages 10-12 years. The narrative centres on securing a successor to the Guardian of History (Fig. 1). The student takes on a teacher role and his/her task is to teach a time elf (Fig. 1), i.e., a teachable agent (TA), about history so that the time elf can qualify as successor.

A total of 161 (81 females and 80 males) 10-12-year olds from five classes in a Swedish school participated in the study. The students used the educational software and interacted with their agents during four hour-long lessons. At the end of the final session, they were given a questionnaire regarding their experience with the digital learning environment and how they perceived the time elf (their TA). 151 students filled out this questionnaire, but unfortunately identification on several of them were missing and therefore only 89 questionnaires could be linked to information of the students’ gender. Analysis has therefore been conducted on two different datasets with  $N=151$  and  $N=89$  depending on the research question and type of analysis performed.



Fig. 1. To the left the Guardian of History and to the right the time elf Timy

### 2.1 Results - Perceived gender of agent

A Chi square test showed that there was no significant difference between the distribution of perceived agent gender in relation to the student gender ( $\chi^2(4) = 1.199, p = .878$ ). 8% perceived the agent as absolutely a girl, 20% as a little like a girl, 42% as neither a girl nor a boy, 18% as a little like a boy, and 12% (16% of female students and 9% of male students) as absolutely a boy.

## 2.2 Results - Perceived agent personality traits

To answer the first part of the question “Do the perceived personality traits of the agent differ depending on the perceived gender and/or the gender of the students?” one-way independent ANOVAs were performed to compare the effect of perceived gender of the agent on perceived personality traits. There were significant effects of gender on the traits Friendly,  $F(4, 146) = 2.632, p = .037$ , and Encouraging,  $F(4, 146) = 5.116, p = .001$ , but not for Attitude, Self-confident, Curious, Memory or Intelligent.

Many of the analyses showed a pattern where “a little like a girl/boy” were perceived more positively than “absolutely like a girl/boy” and “neither girl nor boy”. This is consistent with previous research that showed that less stereotypically gendered characters were preferred to a more stereotypical [5]. Therefore a new encoding of the agent’s perceived gender was introduced with “Androgynous” (neither boy nor girl), “Moderately gendered” (a little like a boy/girl) and “Strongly gendered” (absolutely like a girl/boy). This encoding was used to perform one-way independent ANOVAs to compare the effect of the perceived degree of gender on perceived personality traits. There were significant effects on the traits Friendly, Encouraging, Memory and Intelligent. Post-hoc tests showed that for Friendly there was a significant difference ( $p < .05$ ) between Moderately gendered ( $M = 70, SD = 31$ ) and Strongly gendered ( $M = 50, SD = 39$ ) as well as Androgynous ( $M = 52, SD = 37$ ). For Encouraging there was a significant difference between Moderately gendered ( $M = 49, SD = 31$ ) and Strongly gendered ( $M = 27, SD = 24$ ) as well as Androgynous ( $M = 32, SD = 27$ ). For Memory there was a significant difference between Moderately gendered ( $M = 35, SD = 30$ ) and Androgynous ( $M = 21, SD = 25$ ). For Intelligent there was a significant difference between Moderately gendered ( $M = 38, SD = 30$ ) and Androgynous ( $M = 25, SD = 27$ ).

Two-way independent ANOVAs showed interaction effects of student gender and agent gender for Friendly, Curious and Encouraging. The post-hoc tests revealed that the male students rated the agent’s traits significantly lower when the agent was perceived as “absolutely a boy” than the female students, see Table 4. It should be noted that although significant the differences are due to very small groups of students since few perceived the agent as absolutely a boy. When repeating the analysis for degree of perceived gender, the same differences were found for Strongly gendered, with also significant differences for Intelligent and Curious.

**Table 1.** Mean and standard deviation,  $M$  ( $SD$ ), for perceived personality traits for female and male students when agent is perceived as “absolutely a boy”

	Friendly	Curious	Encouraging	Intelligent
Female students (N = 7)	73 (19)	68 (9)	45 (5)	35 (17)
Male students (N = 4)	8 (13)	18 (21)	3 (3)	3 (2)
P	.004	.02	.016	.059

## 3 Discussion

Our study revealed no differences between female and male students in regard to the perceived agent gender, most saw it as androgynous or moderately gendered. These

results were interesting as previous studies have shown that “similarity attracts”, in for example [3] 80% of the female students chose a female agent over a male agent. But the results also confirm our previous findings that students accept androgynous agent and sometimes prefer them to gendered agents [6]. In this case the narrative also lends credibility to a character being androgynous since it is humanlike but still fictional.

Agents that were perceived as moderately gendered, i.e. a little like a boy or girl, where also seen as more intelligent, with a better memory, more encouraging and more friendly. This is in line with previous research [5] but with the difference that in this instance the visual appearance is the same for all agents, and it is only the student’s own perception or attribution of gender to the agent that differ. A result contradicting earlier findings [7] was that male students rated the agent perceived as absolutely like a boy very near the negative extremes, e.g. unfriendly, stupid, and complaining.

An interesting avenue to explore further is what guides the students’ attribution of gender to the agent. Is it a conscious decision, is it done quickly, i.e. a first impression, or as a result of the interaction between student and agent? Since a teachable agent is more of a peer than an expert what role does identification and/or role modelling have? A teachable agent will reflect how well the student has taught it, and a low achieving student will have an agent lacking in knowledge and ability. In that case attributing it another gender than one self and not identifying with it can be a way to bolster one’s own ego. It would therefore be interesting to look more into aspects such as if the students’ self-efficacy and the agent’s achievement level influence the perceived gender of the agent.

## 4 References

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