

# It's almost like talking to a person: Student disclosure to pedagogical agents in sensitive settings

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# INTERNATIONAL JOURNAL OF MOBILE AND BLENDED LEARNING

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# **‘It’s Almost like Talking to a Person’: Student Disclosure to Pedagogical Agents in Sensitive Settings**

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## **ABSTRACT**

*This paper presents findings of a pilot study which used pedagogical agents to examine disclosure in educational settings. The study used responsive evaluation to explore how use of pedagogical agents might affect students’ truthfulness and disclosure by asking them to respond to a lifestyle choices survey delivered by a web-based pedagogical agent. Findings indicate that emotional connection with pedagogical agents was intrinsic to the user’s sense of trust and therefore likely to affect levels of truthfulness and engagement. The implications of this study are that truthfulness, personalisation and emotional engagement are all vital components in using pedagogical agents to enhance online learning.*

*Keywords:*     *Disclosure, Engagement, Learning, Pedagogical Agents, Pedagogy, Personalisation*

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## **INTRODUCTION**

In many ways it would seem that emerging communication technologies are disrupting and changing societal norms and conventions (Turkle, 2011). Whitty and Joinson (2009) have suggested that central to making sense of the unique qualities of cyberspace are understandings of such social networks and veracity, and studies by Yee (2006) and Bailenson, Yee, Blascovich and Guadagno (2008) also indicate

that issues of online and offline behaviour bear further exploration. We propose that as pedagogical agents are seen to help support and even improve the level of interactive learning on a programme or course (Kim & Wei, 2011), it is essential that these societal norms and behaviours are considered within pedagogical agent learning situations.

Pedagogical agents are characters on the computer screen with embodied life-like behaviours such as speech, emotions, locomotion

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tion, gestures, and movements of the head, the eye, or other parts of the body (Dehn & van Mulken, 2000). These technologies have been increasingly adopted and tested in educational settings, yet little is known about the ways in which they can be used effectively, and indeed whether they can provide additional value to learning experiences. Further, the research that has been undertaken has not yet drawn clear distinctions between application across disciplines and in difficult and sensitive settings (Heidig & Clarebout, 2011).

Such technologies seem likely to become a part of students' daily lives outside of the educational arena. As consumer access to information has changed, the technology used to present chatbots (by our definition, commercial and business agents as opposed to pedagogical agents) to the user has reached a level where interacting with a pedagogical agent seems both normal and rewarding; this would seem to be important for a student's ability to engage emotionally with a pedagogical agent. Recent advances in Flash and HTML-5 technology can be used to deliver dynamic and speaking chatbots<sup>1</sup>, offering a richer and more engaging experience than lines of text on a screen. Whereas early pedagogical agents were simple command line text interfaces, modern pedagogical agents are typically implemented as head-and-shoulders Flash or video animations, and often with the addition of text-to-speech functionality. Indeed pedagogical agents need not be limited to the web, and companies such as Daden have implemented pedagogical agents with IM services such as MSN<sup>2</sup>, as email and SMS responders, and even as full body avatars within virtual worlds such as Second Life. Further, the integration of web-services into pedagogical agents means that they can access live services to provide up-to-date information in their responses, and prevent the need to store all knowledge in the pedagogical agent. Thus whilst pedagogical agents are primarily utilised in blended contexts at present, as mobile technology becomes increasingly present in our daily lives, it is likely that these applications will transfer to mobile settings.

These technological advances offer new opportunities to implement pedagogical agent technology, when provided with pedagogical underpinning. McWilliam (2005) has argued that new possibilities for teaching and learning necessitate a rethinking of curriculum design, and that new technologies themselves cannot be relied upon to change anything. It would seem that the attention of many researchers has centred on the relationship between the pedagogy and the technology, whilst the attention of others has been focussed on the multiple perspectives that individuals bring to the learning encounter, based upon prior experience, knowledge, and the influence of culture and worldview (Gergen, 2003). As Dourish (2006) argues, the growth of mobility, mobile technology and information bring to the fore questions about practice and spatiality and whether technological practices are in fact spatial practices. In this sense, the application of pedagogical agents in mobile and blended settings do not raise technological questions but rather questions of if, and how, these technologies in new spaces alter how pedagogy might be seen. Perhaps what is being seen is what Thrift has termed "augmented existence", in which it is not just tagging and integration of new technologies that affects our lives and practices but the recognition that the meta systems themselves become a new form of categorization (Thrift, 2006).

This paper reports on the findings from a preliminary study of pedagogical agent use in educational settings, designed to consider student reactions to pedagogical agents in sensitive and research-focused settings. Students were asked to respond to a web-based lifestyle values and choices survey delivered by a pedagogical agent on topics of medium levels of sensitivity. These topics were: finances, plagiarism, alcohol, drugs and sexual health. The intent of the study was to evaluate the potential influence of a pedagogical agent in affecting a person's reactions and responses with regards to truthfulness, disclosure and personal engagement, and to use these findings to consider its application in and beyond educational contexts. We suggest that any findings are particularly relevant to disciplines of a sensitive nature, such as healthcare.

The central argument of the paper is that truthfulness, personalisation and emotional engagement are all vital components in using pedagogical agents to enhance online learning. The paper begins by reviewing the current literature and knowledge of pedagogical agent use in blended learning contexts, focusing on informing theories such as realism, emotional engagement and immersion. The method and context of the study is then provided. The findings are presented and situated within the relevant body of literature and the paper concludes by offering several recommendations for practice.

## LITERATURE REVIEW

The literature on the use of conversational agents is small and varied. Themes across the literature indicate that their use is under researched and under discussed in terms of the possibilities in higher education. For example, conversational agents might be used in libraries as virtual assistants, as mobile campus guides or as mentors for students in clinical settings as a mobile app. The literature to date indicates found key foci, namely technological design, emotional design, and immersion.

### Technical Development

Early work such as that by Santos and Osorio (2004) used Virtual Agents to assist users and help them navigate in and interact with the virtual environment in both e-commerce and distance learning contexts. Chittaro and Ranon (2000) have further considered adaptation in the context of e-commerce. A set of personalization rules exploits a model of the customer to adapt the virtual store, such as the display of products, as well as the navigation and different layouts of the store. They also applied their techniques to e-learning (Chittaro & Ranon, 2008) and introduced Adaptive EVE, an e-learning platform tailored to the knowledge level of the learners and to their preferred learning style.

In more recent years, improved technical development and realism of anthropomorphic pedagogical agents has further expanded their

potential for learning (Clark & Mayer, 2008). Kim and Wei (2011) found that students chose same gender and same ethnicity pedagogical agents when provided with the opportunity, and that this had no impact on their learning experience and retention. However, audible realism was found to be particularly important to positive student perceptions of the pedagogical agent. Studies and innovations exploring the influence of voice found that computer-synthesized voices were perceived less favourably than human voices, with the emphasis placed on words, and pauses between words, improving student learning in a pedagogical agent situation (Clark & Mayer, 2008). Furthermore, split-attention effect (Garau et al., 2003), in which students experience a higher cognitive load due to competing demands for their attention, occurred when students felt a pedagogical agent's voice and appearance did not match and were therefore distracted from the learning activity at hand. Even though there are authors who do not advocate the use of an human-like agent instead of a simple chat-window (e.g. Shneiderman & Plaisant, 2004), there is a large research community attempting to implement believable and life-like digital agents as user interfaces with capabilities like gaze or gestures (e.g. André & Rist, 1996, Cassell et al., 2000). Such research focuses on the impact of factors such as appearance (Dunsworth & Atkinson, 2007), dialogue (Veletsianos, 2009), competency (Kim, 2007), and self-awareness (Ijaz et al., 2011). It would seem, therefore, that a lack of a perceived realism can impact students' willingness to engage with the pedagogical agent, establishing technical development as key to the effectiveness of these technologies in educational settings.

### Emotional Design

Evidence has shown that many users are not only comfortable interacting with high-quality pedagogical agents, but that an emotional connection can be developed between users and pedagogical agents, resulting in a more positive engagement experience. These findings should be considered in relation to the work of Lessler

and O-Reilly (1997), who, amongst others, have found that self-administered surveys can yield more truthful responses than interview methods and that this is particularly so when respondents are reporting on sensitive, personal or intricate information. Hasler, Touchman and Friedman (2013) found, in a comparison of human interviewees with virtual world chatbots (pedagogical agents in non-learning situations), that chatbots and human interviewees were equally successful in collecting information about their participants' real live backgrounds. Pedagogical agents, as neither human interviewees nor text-based surveys, therefore pose an interesting opportunity for the educator seeking to facilitate student discussion of sensitive topics.

The disclosure of information, especially of sensitive information, requires the formation of a trust relationship (Wheless & Grotz, 1977). Corritore, Kracher and Wiedenbeck (2003) propose that websites can be the objects of trust, in which trust is 'an attitude of confident expectation that one's vulnerabilities will not be exploited' (2003:70). For them, the concepts of risk, vulnerability, expectation, confidence and exploitation play a key role in information disclosure in an online environment. It would appear that such findings can also be applied to pedagogical agent situations.

This emotional connection has been found to be one of the strongest determinants of a user's experience, triggering unconscious responses to a system, environment or interface (Éthier, Hadaya, Talbot, & Cadieux, 2008). These feelings strongly influence our perceptions, enjoyment, and pleasure, and influence how we regard our experiences at a later date. Emotional design at the basic level involves minimising common emotions related to poor usability such as boredom, frustration, annoyance, anger and confusion. Dennerlein, Becker, Johnson, Reynolds and Picard (2003) stated that during a computer task, systems usability may play a role in creating stressful situations that manifest themselves into various exposures to biomechanical stressors. Thus emotional design also should also focus on invoking positive emotions associated with acceptance of the

system and continued usage (such as inspiration, fascination, perception of credibility, trust, satisfaction, appeal, attachment).

## Immersion

Captivating a user's attention can also induce a sense of immersion or presence (Robertson, Czerwinski & van Dantzich, 1997; Steuer, 1992). This is a complex concept related to the physical senses and mental processes of the user, the required tasks within the environment and the types of interaction and technology involved (Pausch, Proffitt & Williams, 1997). This engagement of the student in the learning experience is argued to focus and improve learning (Kang, Kim, Choi, & Park, 2008). Dede (1995) suggests that within learning environments, immersion can be created through the capacity to execute actions, through symbology and semantic associations, and through physical and sensory provision. Mental and emotional immersion has to be considered independent from visual or perceptual immersion (Robertson et al., 1997). The concept of immersion is closely related to that of social presence, in which users might feel 'present' in an interaction with a pedagogical agent. This experience is seen to be critical to the effectiveness of learning with a pedagogical agent, and occurs when a user is immersed in the interaction (Kim & Baylor, 2006).

A different stance toward immersion is explored by Slater et al. (2009) who examined the idea of inducing illusory ownership of virtual limbs. They presented three experiments that investigated how virtual limbs and bodies can come to feel like real limbs and bodies, and discussed related studies that indicated that the ownership illusion may be generated for an entire body. The finding of these studies suggest: 'that ownership of virtual limbs and bodies may engage the same perceptual, emotional, and motor processes that make us feel that we own our biological bodies' (p219). Slater (2009) argues for 'place illusion' and 'plausibility illusion' as concepts that are helpful in understanding why people respond in particular ways in virtual



reality. Place Illusion' (PI) is used for the type of presence that refers to the sense of 'being there' in spite of knowing that you are not, whereas 'plausibility illusion' (Psi) is defined as how the world is perceived: 'Psi is the illusion that what is apparently happening is really happening (even though you know for sure that it is not)' (p8). What Slater largely seems to be suggesting is the immersion is related to 'qualia', the illusion of being there, and thus immersion depends predominantly on the level of qualia, which is seen to be higher in VR than in desk top systems, which require more deliberate attention. Yet the sense of immersion does seem to be affected by emotion that may emerge directly from immersion or illusion.

The literature discussed above found that understanding of pedagogical agent application, whilst increasing, is inchoate. The realism and voice of the pedagogical agent is seen to help shape emotional connection, which is further informed by concepts of presence and immersion. Yet this emotional connection and thus the potential learning application of these technologies, is determined partially by levels of trust and risk, as Corritore et al. (2003) noted. Such findings suggest that the context within which the student and pedagogical agent are interacting, whether in an interviewing context or in discussion of sensitive topics, for example a counselling module, is critical. This paper now goes on to present the findings of a study focused on these issues in particular.

## RESEARCH METHODOLOGY

This study adopted an evaluation approach. Evaluation has been used to study an organisation or curriculum in such a way as to contribute to a review of policy and/or decision making within the organisation. Originally evaluation was an important part of enabling improvement to be made in educational curricula. Evaluators such as Cronbach (1963) and Scriven (1967), followed by Stufflebeam et al. (1971), developed the idea of evaluation as a service for administrators and managers in education. The work of Stake (1976) was influential in develop-

ing different types of evaluation and pointing out that evaluation should be seen as both a political and ethical activity. During the 1960s-1970s, evaluation involved collecting information to inform decision making. However, in the late 1970s and early 1980s, a shift occurred and evaluation came to be seen as something from which to learn and make changes, rather than a process of being judged. Simons suggests that this shift occurred due to:

*The realisation of the difficulty of informing particular decisions, evaluations forming only one small part of the data that is taken into account in coming to a decision; over-reliance on a model of decision making that has little correspondence with reality; and a reassessment of the responsibilities of evaluation. (Simons, 1987: 20)*

It was thus in the 1980s that evaluation moved away from being an act of judgment about the merits of a programme and moved toward being an exploration of what could be learned about a programme. It is with this approach in mind that we adopt Stake's (1983) responsive evaluation methodology, a pragmatic approach in which attention is given to the information and issues that those involved in the evaluation want to know about and the questions to which they want answers. Therefore evaluation here is undertaken in relation to specific situations, contexts and questions.

Responsive evaluation according to Stake (1983) is:

- Reliant on natural communication;
- Focused on activities being undertaken rather than the intentions of those activities;
- Responsive to the stakeholder requirement for facts and knowledge;
- Considerate towards the different views and principles of those involved in the evaluation.

This evaluation therefore explored the extent to which pedagogical agents may affect a person's reactions and responses with

regards to truthfulness, disclosure and personal engagement. Tourangeau (2004) proposes that the best solution for data collection combines a self-administered approach with face-to-face interviewing, as these typically obtain the highest participation rates of all survey methods. Computer-based interviews in which the individual is talking to an avatar (a 'pedagogical agent') rather than to a person may offer an environment for this. The model of responsive evaluation takes into account the differences between what is supposed to happen and what actually happens, and thus the research team believed that it would enable the objectives of evaluation to be met whilst also providing data which would be useful for a variety of relevant publics, such as the university, the funder and the student union.

## Research Questions

The specific aim of this research was to examine the extent to which the use of pedagogical agents might affect students' truthfulness and disclosure about their lifestyle choices and beliefs. Its intent, therefore, was to consider the ways in which pedagogical agents might be used in sensitive educational settings such as healthcare, as well as within research and data collection settings.

The literature reviewed in this paper has shown that responses to pedagogical agents in sensitive settings are highly individual. Despite this, we have identified certain patterns which bear further exploration. As noted earlier, the realism and voice of the pedagogical agent is seen to help shape emotional connection, which is further informed by concepts of presence and immersion. Yet this emotional connection and thus the potential learning application of these technologies, is determined partially by levels of trust and risk.

The study sought to explore the following objectives:

1. How do pedagogical agent appearances affect student perceptions?
2. To what extent do students prefer and respond to different styles of pedagogical agent?
3. How much information are users happy to disclose when engaging with the pedagogical agent?
4. To what extent might pedagogical agents influence or affect a person's reactions and responses with regards to truthfulness, disclosure and personal engagement?

These particular research objectives take note of current research directions and gaps within the research. Whilst the appearance (realism) and voices of pedagogical agents have been addressed as research topics, they have often been treated separately; this pilot study aimed to bring together previously disparate research areas. Further, as we have contended, prior research into the use of pedagogical agents has neglected the importance of context in informing student willingness to engage and disclose information.

This project was funded as part of a study into the potential influence of pedagogical agents (also known as 'chatbots' in non-educational environments) by the Ministry of Defence. Development work was undertaken by Daden, and evaluation completed by Coventry University. Ethical clearance was gained through Coventry University ethics committee.

## Technical Development

The development stage of this study involved the creation and testing of the pedagogical agents. This involved:

- The creation of a website with information on sensitive issues (finances, plagiarism, alcohol, drugs and sexual health) to put the agent into context;
- The conducting of a trial with 5 users to find out what visual representation of the agent is preferable, based on age/gender/race/authoritativeness;
- The creation of a question and answer database and addition of the pedagogical agent



on the site as a general question-answering and advice agent.

The chosen questions for this study were programmed into the pedagogical agent interface, and 6 avatars were selected for the students to choose from. Following from research presented in the literature review, the research team ensured that the selection of pedagogical agents represented a range of ethnicities, ages and genders. The pedagogical agents were then tested with 5 volunteers to correct any technical issues and test the wording of the questions.

## Data Collection

Twelve students (m=4; f=8, both postgraduate and undergraduate) were recruited to participate in the research section of this project.

Data were collected through the following methods:

1. An online questionnaire with an interactive pedagogical agent, in which students were asked questions on sensitive issues including financial management, plagiarism, alcohol, drugs and sexual health.
2. A semi-structured face-to-face interview on the topic of the student's experience of using the interactive pedagogical agent (average 30 minutes). The interview was audio recorded and transcribed for data analysis purposes.

Student responses from the pedagogical agent questionnaire (Method 1) are not reported here as these findings are not relevant to our research objectives. Instead, the questionnaire provided a testing phase and a means through which to facilitate student-pedagogical agent interaction, providing impetus for the interview process in Method 2. This interview was undertaken to discuss students' experiences of engaging with the pedagogical agent and focused specifically upon the research objectives identified above. The findings from student interviews are presented in this paper.

## Data Analysis

Analytical coding was used at the outset to derive codes based in the thick description of interview data. Charmaz (2006), for example, suggests asking the following questions about the data when engaged in analytical coding:

- What is going on?
- What are people doing?
- What is the person saying?
- What do these actions and statements take for granted?
- How do structure and context serve to support, maintain, impede or change these actions and statements?

Having undertaken this initial phase of coding data were then analysed. The ultimate goal of qualitative data analysis is "to make sense out of the data" (Merriam, 2009: 203), with an intentional effort toward answering the research questions. Hatch (2002) describes it this way:

*Data analysis is a systematic search for meaning. It is a way to process qualitative data so that what has been learned can be communicated to others. Analysis means organising and interrogating data in ways that allow researchers to see patterns, identify themes, discover relationships, develop explanations, make interpretations, mount critiques, or generate theories. It often involves synthesis, evaluation, interpretation, categorisation, hypothesising, comparison, and pattern finding. It always involves what Wolcott calls "mindwork" ... Researchers always engage their own intellectual capacities to make sense of qualitative data. (Hatch, 2002: 148)*

## FINDINGS

We now turn to findings from the interview data. In total 3 themes were identified which were truthfulness, emotional engagement and personalisation.

## Truthfulness

Students oriented their discussions of truth and truthfulness around the *realism* of the pedagogical agent. This referred specifically to how participants typically responded in correspondent face-to-face situations, and notions of judgement and acceptance. For some participants, their awareness that the pedagogical agent was not real encouraged a sense of disinhibition in which participants felt emboldened to share answers to sensitive questions without fear or awkwardness. For example, Rose commented:

*If you do it with a real person then you might feel a bit scared and awkward. So it's more personal but not so personal that you feel a bit awkward. I think if you were talking to a person and they were asking those questions you would feel really embarrassed and you wouldn't want to, you wouldn't want to tell the truth. (Rose, undergraduate student)*

Here, the pedagogical agent was positioned between two points of comparison – an online survey, and a face-to-face interview. The pedagogical agent was seen to provide an additional level of personalisation but was still separate from the embodied interaction between two individuals. The lack of realism of the pedagogical agent thus provided a safe space within which the student felt empowered to share truthful answers.

The pedagogical agent's lack of memory, and inability to recall discussions was also seen as a positive point. In situations where the pedagogical agent was clearly positioned as something 'other' than human, users were expected to respond with different emotions. It is posited by John below that interaction with a pedagogical agent would not invoke an emotional response of shame and thus allow users respond with truthfulness:

*Some people might find their behaviour shameful, particularly if they had been cheating in their degree or something like that, they would probably lie to a real person, because then they*

*would know that they cheated on their degree. But to a bot they'd be more inclined to be honest about it. (John, undergraduate student)*

For others, such as Rachel, this disinhibition was clearly related to notions of judgement and fear of reprisal:

*It didn't matter what you said to it, I found that you could be truthful with it because there was no-one you were talking to that could judge you. (Rachel, undergraduate student)*

Students here spoke of the pedagogical agent as though speaking into an ether; the pedagogical agent was seen as a vacant yet embodied being to which students were able to express truth without fear of judgement. For this student, 'it didn't matter' what you said to it; truthfulness is revealed only insofar as it has no consequence.

Conversely, for others, the physical manifestation of the pedagogical agent, and its visual realness in comparison to an online survey, *encouraged* them to share the truth:

*And I think one of the questions in it was whether it made me sort of more truthful? And I think that it does because you feel a bit guiltier, because it's almost like talking to a person. (Alice, undergraduate student)*

Alice, above, saw the pedagogical agent as being almost like a person, and so the emotions she expects to feel are similar to those in face-to-face interactions. Thus truthfulness was seen to be essential, or at least preferred, when interacting with the pedagogical agent; in comparison to truthfulness and potential judgement being of little consequence.

For those who related best to the pedagogical agent, it provided a means through which students felt able to open up and communicate truthful answers:

*You know when you're answering questions, if someone was to give you a questionnaire*

*sometimes you don't want to open up or you don't want to give the true answers whereas with this, you feel like you're communicating with someone in person. (Mary, undergraduate student)*

Unlike Alice, Mary's willingness to 'open up' to the pedagogical agent did not emerge from a sense of guilt but rather a genuine emotional engagement and willingness to share her perceptions and experiences.

These findings closely related to the concepts of immersion and social presence, which are seen to be essential to learning using pedagogical agents (Kim & Baylor, 2006). This sense of presence can be social, cognitive, or emotional, and would seem to be vital in the development of realistic engagement with pedagogical agents, thereby enhancing and improving disclosure. This absorption and engagement is argued to focus and improve learning (Kang et al., 2008) and therefore would seem to be central to understanding the ways in which disclosure can be improved in the use of pedagogical agents. It is notable that those participants experiencing a greater sense of social presence with the pedagogical agent did not suggest experiencing feelings of judgement when disclosing sensitive information. Whilst for some students the interaction with a pedagogical agent invoked emotional responses, these did not parallel expected emotional responses when engaging in face-to-face interactions. The following theme explores this in more detail.

## Emotional Engagement

Students spoke of emotional engagement through their sense of personal connection to the pedagogical agent. The findings from this theme suggest that the greater the emotional engagement, the more positive the experience was. Continuing from Mary's quote above, students argued that they felt a sense of being in a panoptical space: the feeling of someone 'listening' or 'being there'.

*It felt, I don't know, maybe the fact that someone was there in a sense, you felt a bit more, oh okay someone's listening, sort of thing, than when it's a questionnaire it's like oh no one will really read this. (Sally, undergraduate student)*

In comparison to John's quote in the truthfulness theme, for Sally, the pedagogical agent was anything but an empty vessel. Here, it was seen as a 'someone' who was able to take in and listen to information, and paid attention to her thoughts and opinions.

For others, there was also a sense that there was a lack of emotional connection with the pedagogical agent, a belief that it was not 'taking in' their answers:

*And it felt a little impersonal at times because you know you move from one topic to another topic, very separate topics, and it was almost like, you don't care what I'm telling you do you? (Claire, undergraduate student)*

Here, the pedagogical agent was seen to be 'listening', and when its responses did not confirm to the expected norms, she was disappointed. The pedagogical agent's inability to formulate responses based on Claire's dialogue was interpreted as not caring about what she has to say. In this sense, typical conversational norms are anticipated and imposed upon the pedagogical agent. When it failed to fulfil them, the pedagogical agent was not seen as a technology but rather a conversational partner with a lack of investment in the engagement.

For others, the physical appearance and body language of the pedagogical agent hampered their ability to emotionally engage in the interaction. For example:

*I didn't think it was like talking to a person at all really, I found the [pedagogical agents] very robotic, I mean they sort of moved in a very robotic, plastic fashion and occasionally blinked or something, it wasn't very high fidelity. (Tom, postgraduate student)*

Here, Tom's perceptions of the pedagogical agent's body language and facial expressions challenged his ability to perceive it as person-like. Alternatively, for others these characteristics did not detract from the realism of the pedagogical agent but rather emphasised it by imbuing it with person-like qualities such as impatience.

The theme of emotional engagement highlights the individuality of student responses to interaction with the pedagogical agent. It also emphasises that in situations where the student seemed to experience immersion and presence in the engagement, the ability of the pedagogical agent to interact could both improve and detract from their emotional engagement in the interaction. This sense of emotional engagement could be improved through personalisation, which is explored in the following theme.

## Personalisation

The use of personalisation here focused on using pedagogical agent technology to accommodate the differences between individuals and provoke and encourage choice. Here, there were a wide range of responses in terms of engaging with the pedagogical agent in relation to body language and voice. The addition of voice and lip-syncing, for this student, improved its realism in comparison to an online questionnaire:

*It felt more real than just having the words coming up and you know, it just felt like you were having interaction and sort of engagement with the [pedagogical agent]. It just gave a bit more realism to the conversation, whereas, instead of just reading the words and answering and looking down and stuff, it was more like watching her speak, like I said you felt more like you were actually engaging, talking with someone. (Beth, undergraduate student)*

Another student felt somewhat disarmed due to the body language of the pedagogical agent not matching up with the tone of the question, and offense at certain phrasing.

*It made me slightly nervous. And I actually felt pressured to answer quicker. I thought well yes, I wanted to be truthful, but I actually wanted to think about the question, and wanted to answer it with a bit of a reflection. I thought these questions were really getting, you know, they were quite personal, and that is not something I would like to answer on a surface, so I had a feeling that they were in a way deep questions but the body language was like, yeah, come on, next question. (Pam, postgraduate student)*

Pam's engagement with the pedagogical agent as a conversational partner challenged her ability to respond to the questions in what she considered to be an adequate time period. Like Claire in the previous theme, she struggled with the technical characteristics of the pedagogical agent and specifically the sense that its body language invoked. By not displaying characteristics such as leaning forward or demonstrating investment, instead waiting for her response, the pedagogical agent suggested a sense of impatience which she found troublesome.

Students also valued the opportunity to make choices about who they spoke to. For example, some students chose a particular face according to approachability or friendliness.

*I find it easier talking to women, so I looked through the women, and the person, she looked like a newsreader, a correspondent. (Colin, undergraduate student)*

Colin, whilst choosing a gender he would typically speak to, focused specifically on the impression the pedagogical assistant gave. A newsreader might invoke a sense of professionalism, authority and, potentially – referring to the first theme of this study – of trustworthiness. For others, it was more important that the pedagogical agent appear to be a friend:

*I was sort of looking through and he was sort of, he looked my age. So it wasn't as threatening. I don't know, I felt that if it was someone my age, I felt it would be like a one to one chat*

*instead of an interview with someone older  
(Sally, undergraduate student)*

This student made a clear decision about the kind of interaction she would prefer in this particular context. An older pedagogical agent might have appeared threatening, whereas a younger pedagogical agent suggested more of a casual, intimate atmosphere.

The decision on which pedagogical agent to use was treated with great consideration:

*I was interested in being able to choose the pedagogical agent, and why I chose who I did. And I thought it was positive because I liked the look of the person I chose, and it did make it more personal, being asked questions by that pedagogical agent. She looked kind, friendly. And young, beautiful. And yeah, approachable.  
(Claire, undergraduate student)*

As with other pedagogical agent choices, the approachability of the agent was perceived to be important, taking into account the subject matter. Claire seemed to identify with her pedagogical agent, finding the interaction more personal because of the qualities she observes and identifies with.

As seen in this theme, different learners have different characteristics, preferences, prior knowledge, skills and competences, motivation or needs, which may influence their learning process and experience and engagement with the pedagogical agent. Students' emotional engagement in the interaction, and willingness to disclose truthful information, were thus informed by their ability to personalise their pedagogical agent.

## DISCUSSION

The findings of this study suggest that 3 key issues are important; firstly the pedagogical appearance of the agent, secondly, the issue of choice and finally that of disclosure. The appearance of the pedagogical agent and the images it invoked, determined partially by students'

ability to choose their own pedagogical agent, were found to play a role in students' willingness to disclose information. The relationship between these issues is now addressed.

Pedagogical agent appearance was discussed in two distinct ways in this project. Firstly, participants referred to the realism of appearance. As Clark and Mayer (2008) discussed, the realism of anthropomorphic pedagogical agents can play a key role in determining student perspectives of the pedagogical agent experience. Yet situations in which the realism of the pedagogical agent was felt to be compromised could result in entirely different reactions for the students. For some, it resulted in split-attention effect (Garau et al., 2003) in which the student struggled to focus on interaction. For others, the effect of body language was integrated into the experience. In this circumstance, the realism of the pedagogical agent was perceived to be strong enough to counter split-attention effect despite its body language. These findings support those of Woo (2009), which suggests that body language is critical to the learning effectiveness of pedagogical agents. Whilst it may not always result in split-attention effect, as in face-to-face interactions, it is critical for assuring student openness and ability to engage comfortably in the interaction.

The second appearance effect referred to the physical appearance of the pedagogical agent when adequate realism has already been assured. Participants did not identify physical characteristics but rather the emotions that these characteristics invoke. Feelings of approachability, friendliness and professionalism seemed to be particularly important, along with ensuring a non-threatening approach. The physical appearance of the pedagogical agent thus helped to shape participants' feelings of immersion in the engagement and the sense of social presence they experienced (Robertson et al., 1997; Kim & Baylor, 2006).

These findings would seem to support those of Heidig and Clarebout (2011), who suggest that choice plays a key role in determining student reactions to pedagogical agents. This relates to the fact that student preference differs and, as



of yet, has proven difficult to predict. It would seem that a variety of genders and ethnicities is particularly important for emotional engagement with the pedagogical agent. What seems to be particularly important is the context within which the pedagogical agent is placed. In this study students preferred friendly, approachable pedagogical agents. It is important to highlight that these roles are often specific to the context, discipline and indeed to individual modules, and thus adaptivity of the system is essential.

Qualitative findings from users also suggested that they may feel comfortable disclosing more sensitive information to pedagogical agents than to the interviewer. Such findings support those of Barak and Gluck-Ofri (2007), who suggest that the social environment of cyberspace is characterised by more open, straightforward and candid interpersonal communication, and that a pedagogical agent can support this. This pattern of communication has been explained through disinhibition effects (Joinson, 1998) which are theorised to arise through deindividuation (Postmes, Spear & Lea, 2000), or the emergence of 'true self' (Bargh, McKenna, & Fitzsimons, 2002). Of importance in this study are also situational factors including anonymity, invisibility, neutralisation of status and lack of eye contact (Suler, 2004). Although acknowledged that the protected environment of cyberspace and its associated sense of privacy is false (Ben-Ze-ev, 2003), it is suggested that these attributes contribute to the enhanced disclosure of often intimate information.

## LIMITATIONS OF THE STUDY

There were a number of limitations identified in this study. A follow-up study is currently being undertaken which seeks to examine the issues raised in this study further. The limitations were:

1. Only 12 students were recruited, meaning that any findings cannot be generalized. A larger and more varied sample population is necessary in any future studies.
2. The study was undertaken over only three months, explaining the low sample size. Any further studies should be extended to at least one year.
3. There were technical difficulties with the pedagogical agent software, meaning that it was often difficult for students to manage. Future studies should pay careful attention to the user friendliness of technical delivery.

## RECOMMENDATIONS

Based upon the findings from this pilot study, six key implications have been identified:

1. The adaptivity of the system and emotional connection to the pedagogical agent are intrinsic to the student's belief that they can trust and therefore be more truthful. By capitalising on an understanding of user emotions there is an opportunity to enhance the level of individual connection with the learning environment and the sense of immersion offered.
2. The amount of truthful information divulged was dependent on how well the participant engaged with the pedagogical agent. For example one student wanted to divulge more information but felt rushed by the pedagogical agent body language and movements. Another did not divulge as much information as he did in a paper questionnaire due to associating the pedagogical agent with having a real conversation and 'boring' it with talking too much.
3. An emotional design philosophy will ensure the psychosocial features of the environments as well as physical and cognitive requirements. This emotional connection with the pedagogical agents would seem to heighten the sense of immersion and therefore it is argued, the disclosure potential.
4. Learning and engagement using pedagogical agents provides opportunities for displaying, testing and responding to the emotions of self and others in a safe and non-threatening environment. This can

be either subject specific emotional skills (for example empathy) or non-subject specific in the general sense of emotional intelligence.

## CONCLUSION

The intent of this study was to evaluate the potential influence of a pedagogical agent in affecting a person's reactions and responses with regards to truthfulness, disclosure and personal engagement, and to use these findings to consider its application in and beyond educational contexts. We found that, whilst technical realism is important to willingness to disclose information, what one participant experiences as split-attention affect, can be experienced by another as a conversational partner's lack of engagement. It can be assumed, then, that the ways in which a participant's truthfulness is influenced by using a pedagogical agent is potentially dependent on skill sets, prior knowledge of the technology, personal needs and preferences. Further exploration would be needed to determine this, as well as the individual's perceptions of truthfulness and trust.

Alongside the findings presented above, this study has also identified areas which deserve further consideration in future research; the authors are presently working on a large-scale research project designed to build upon these findings. Future research should also take into account the future progression of pedagogical agent application, mindful of Dourish's (2006) consideration of practice and spatiality with regard to new technologies. As pedagogical agent technologies are increasingly integrated into commercial and educational arenas, it seems likely that they will transfer to mobile as well as blended learning settings. It is suggested, therefore, that such applications require both pedagogical nuance and further research into the ways in student perceptions of pedagogical agents are informed by the context within which they interact.

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## ENDNOTES

- <sup>1</sup> Anna at the IKEA store is an example of this, available at: <http://193.108.42.79/ikea-us/cgi-bin/ikea-us.cgi>
- <sup>2</sup> For example, Ask Frank for drug education, available at: <http://www.talktofrank.com/>



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