Introduction:

Pedagogical agents, visual 'tutor' representations embedded within computer-based learning environments, exhibit lifelike appearance, persona, and social characteristics in attempt to establish an ideal personal learner-agent relationship. The presence of a pedagogical agent alone can increase learner self-efficacy, attitudes, satisfaction, and interaction with the learning environment [1, 2]. While a highly competent agent will most likely have a positive influence on learner's performance and attitudes/perceptions of the agent, a lower competent agent has been shown to positively influence on learner's self-efficacy [3]. Moreover, an emotionally-supportive agent has a positive influence on learner's cognitive performance (including comprehension and retention) [4, 5], self-efficacy [6], and his/her perception of the tutor's believability [7].

Based on previous related research [8], there may be a possibility that a pedagogical agent's emotional support is more influential than its competence to learners' performance and perceptions of the agent. Prior research [9] also suggests that an intelligent tutor's motivational components are as important as its cognitive components and that tutors who are empathetic are conducive to learning. However, there is a lack of research comparing emotional vs. unemotional agents (a key issue in emotional simulation research) [10] as well as evaluating the effect of agent emotion on human psychological responses [11]. Thus, there is an underlying research motivation identify the influential strength/magnitude of agent characteristics (e.g., agent competency and/or emotional support) on the learner-agent relationship when other variables are present.

This poster presents the results of study assessing the impact and interaction behavior of a pedagogical agent's emotional support and competency on learner's self-efficacy, performance, and perceived intelligence and trust of the agent. This study addresses the following research questions:

(1) Is a pedagogical agents' emotional support or competency level more influential to the agent's perceived intelligence and trust; and learners' self-efficacy and performance?

(2) What is the influential strength of a pedagogical agent's emotional support and competency?

(3) How do learners' outcomes change with the inclusion and exclusion of emotional support and competency?

Measured Outcomes:

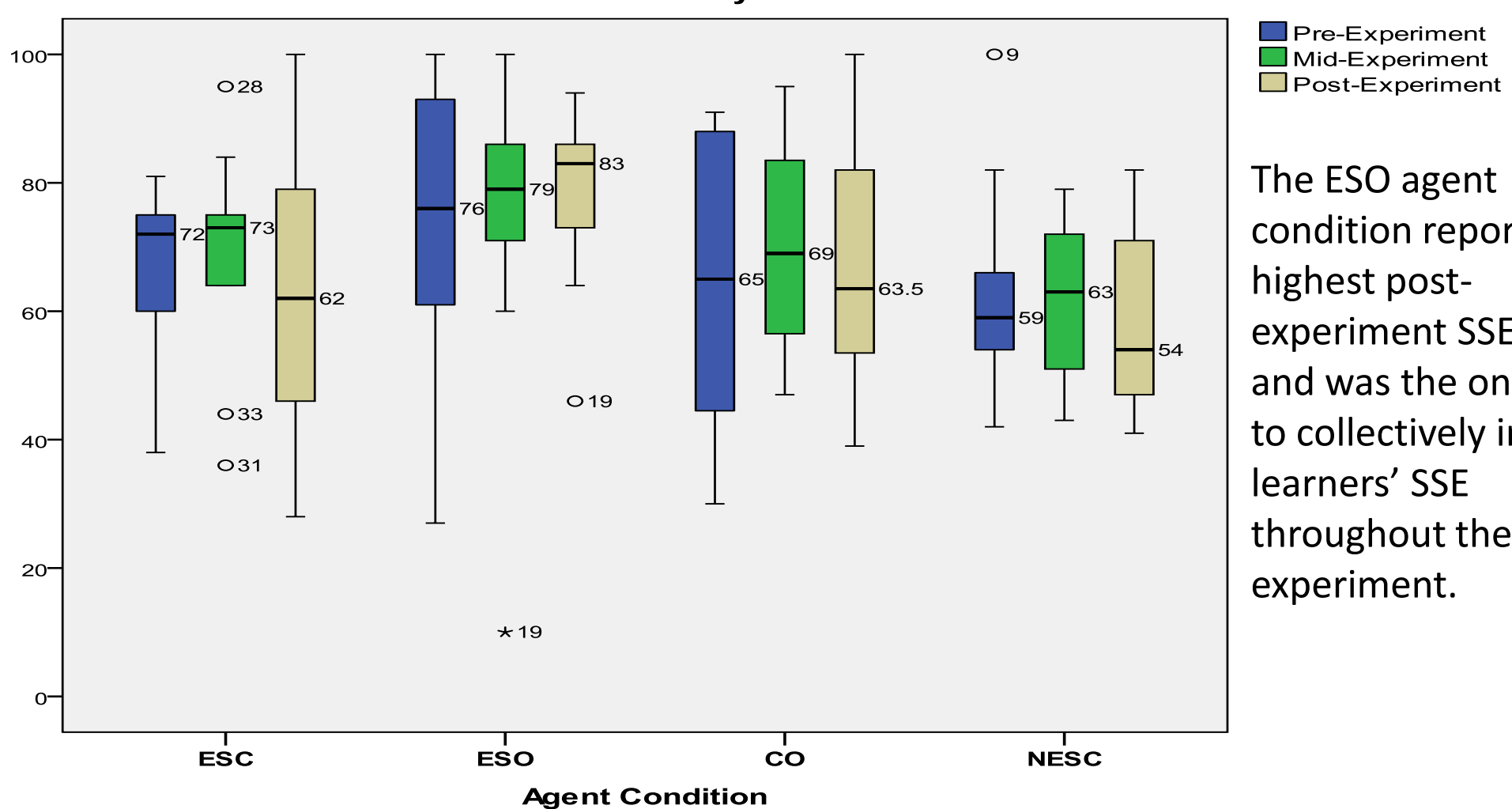| Metric/Construct	Description
Sudoku Self-Efficacy (SSE)	• Consisted of 10 items to measure learners' self-efficacy towards playing Sudoku • Adapted from [12] • Measured on a 10-pt. Gaussian scale
Perceived Intelligence (PI) of Agent	• Consisted of 5 items measuring the degree to which a tutor is smart, intelligent, Capable, successful, and confident • Adapted from [8] (α=.75) • Measured on a 9-pt Likert scale
Perceived Trust (PI) of Agent	• Consisted of 5 items measuring the degree to which a tutor is attentive, sincere, useful, trustworthy, and honest • Adapted from [8] (α=.89) • Measured on a 9-pt Likert scale
Performance	• Based on the number of cells completed after the second Sudoku game.

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Results:

Table 1. Significant correlations between the pre-, mid-, and post –measures of Sudoku Self-Efficacy (SSE), Perceived Intelligence (PI), and Perceived Trust (PT).
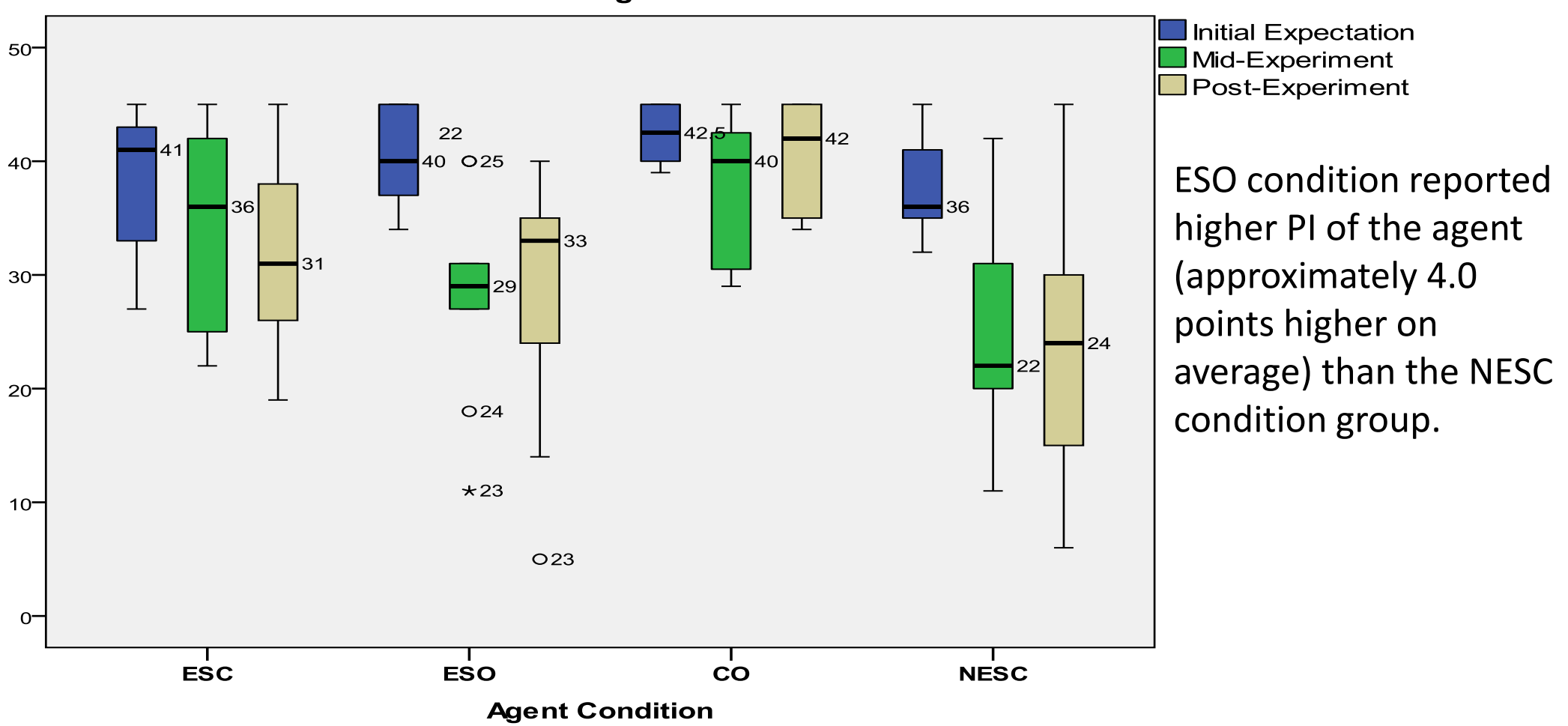
			SSE			PI			PT		
			Pre	Mid	Post	Pre	Mid	Post	Pre	Mid	Post
SSE	Pre	Corr.	1								
		Sig.									
	Mid	Corr.	.644**	1							
		Sig.	.000								
	Post	Corr.	.633**	.706**	1						
		Sig.	.000	.000							
PI	Pre	Corr.	.328	**.383***	**.516****	1					
		Sig.	.055	**.023**	**.002**						
	Mid	Corr.	-.009	.220	.167	.388*	1				
		Sig.	.957	.205	.338	.021					
	Post	Corr.	-.029	.286	.304	.365*	.888**	1			
		Sig.	.869	.096	.076	.031	.000				
PT	Pre	Corr.	.026	-.011	.208	**.389***	**.368***	**.342***	1		
		Sig.	.883	.951	.230	**.021**	**.030**	**.044**			
	Mid	Corr.	.080	.176	.244	**.358***	**.842****	**.669****	.259	1	
		Sig.	.647	.313	.158	**.035**	**.000**	**.000**	.134		
	Post	Corr.	.026	.196	**.368***	**.336***	**.805****	**.826****	.380*	.861**	1
		Sig.	.882	.260	**.029**	**.049**	**.000**	**.000**	.024	.000	

*Significant at p<.05; **Signficant at p<.005

Sudoku Self-Efficacy Results

The ESO agent condition reported the highest post-experiment SSE ratings and was the only group to collectively increase learners' SSE throughout the experiment.

Perceived Intelligence Results

ESO condition reported higher PI of the agent (approximately 4.0 points higher on average) than the NESC condition group.
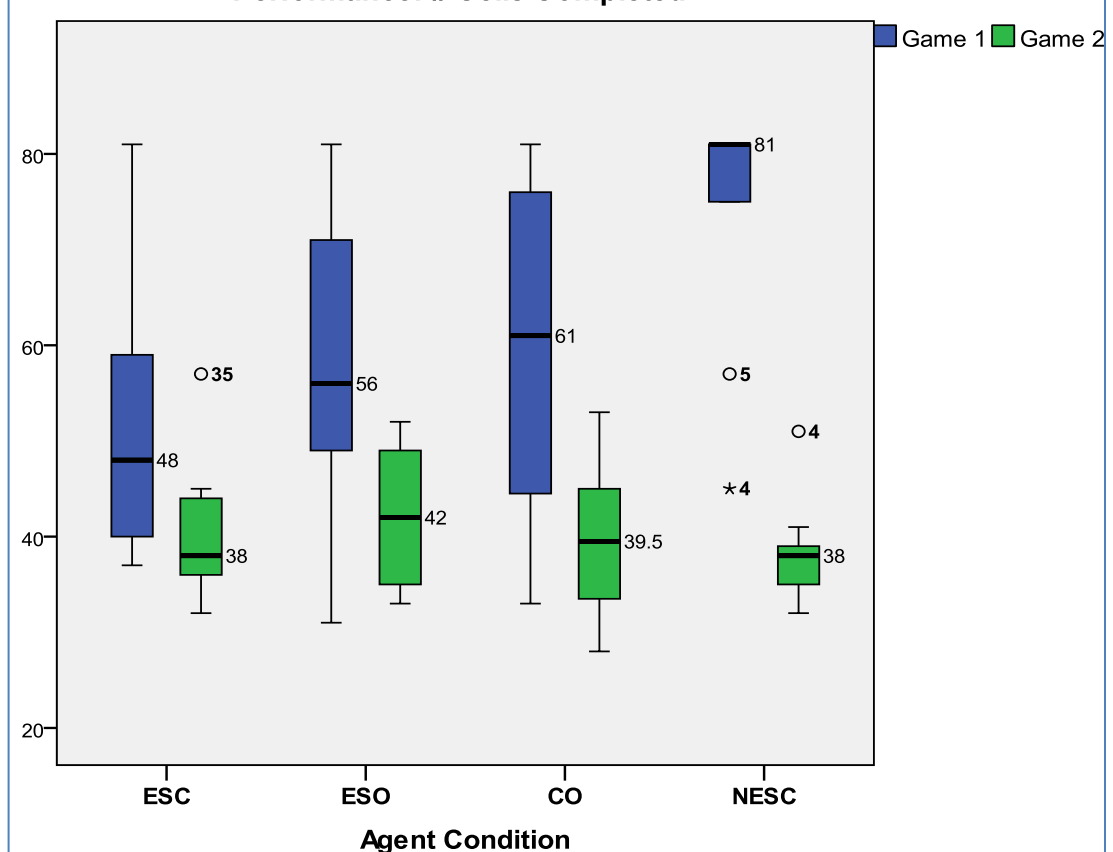

Perceived Trust Results
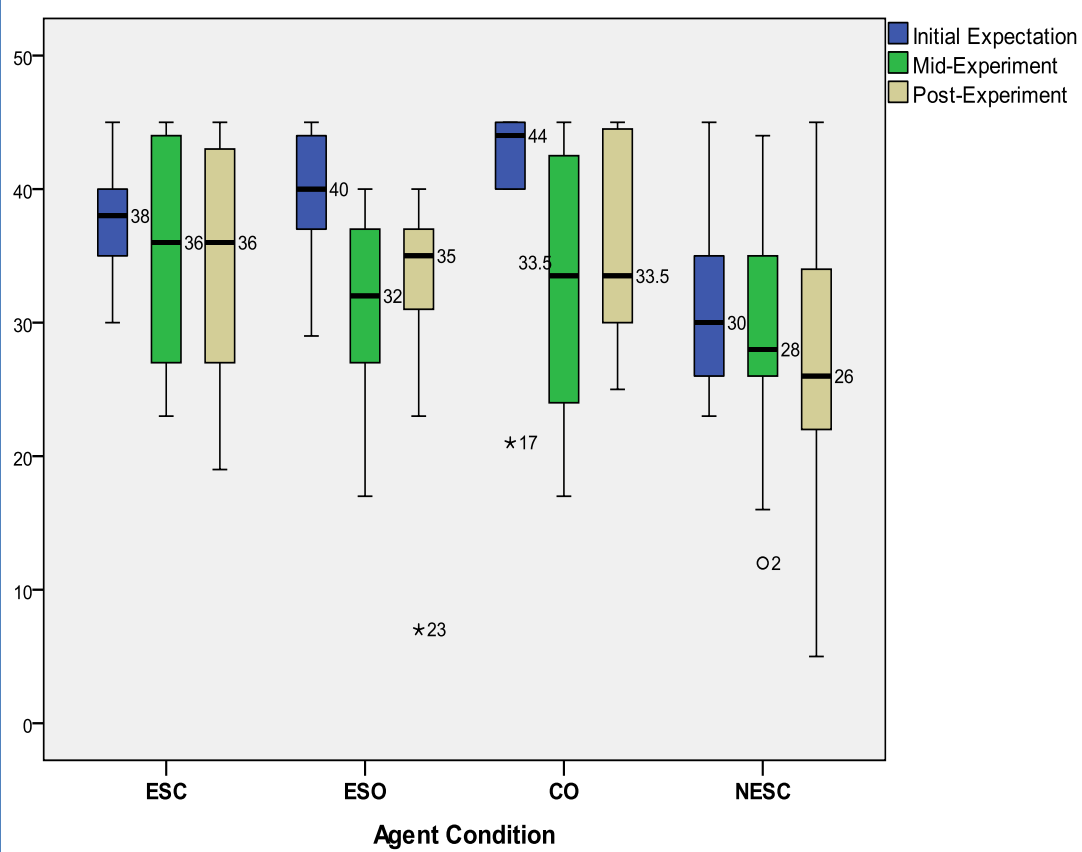
Performance: # Cells Completed

Conclusion:

The results of this study provide insight on learner's responses to the interaction behavior between two essential agent characteristics. Ultimately, this study could lead to better methods of manipulating these independent variables for targeted learners and domains. Identifying the optimal degree of an agent's characteristics can (a) maximize learners' trust and acceptance of both the learning environment and pedagogical agent and (b) increase learners' readiness to learn, self-efficacy towards the domain, and the effectiveness of their learning experiences. Future work could utilize this study's findings to investigate how agent characteristics impact learners' trust/acceptance of the intelligent tutoring system (ITS) the agent is embedded within, thereby increasing our understanding of learners' ITS acceptance, expectations and future usage intentions. Future studies can also assess the impact of agent characteristics on learners' real-time and predictive cognitive and affective states.