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THE ADOPTION OF EMBODIED CONVERSATIONAL AGENTS FOR COMPETENCY DEVELOPMENT

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ABSTRACT

Embodied conversational agents (ECAs) are computer-generated characters that can communicate by text or speech with human participants using artificial intelligence (AI). Advancements in the research field of ECAs have proven to be a successful approach to demonstrate fitness exercises, giving healthcare advice, personal quick access to information, and acting as a teaching assistant in the classroom (Eckert & Mower 2020; Morie et.al., 2013). Tony Bates (2022) recommends online learning to demonstrate decision-making processes and he mentions several benefits of recorded dramatization or a roleplaying scenario. For example, a scenario can effectively show how an expert is looking for signs of serious illness or injury and then show how to make appropriate decisions. Bates calls this methodology experiential learning or learning by doing. He also explains that digital tools can deliver immersive, interactive and scenario-based training exercises that simulate real-world conditions. This model also promotes an iterative process where the student can experience, reflect, think and act during a scenario that requires real time decision-making. Bates has also found evidence that experiential learning increases student engagement and creates better long-term retention of knowledge.

The research objectives of this study was to investigate educational practices for transforming competency development. The main focus was on teachers design of learning activities and active student involvement through interaction with ECAs. The mode of delivery will apply the aspects of cognitive presence from the online learning framework of Community of Inquiry (CoI) that was introduced in a study by Garrison, Anderson, and Archer (1999). The research questions investigated in this study include:

RQ1: *How can embodied conversational agents be used in a training scenario for competency development?*

RQ2: *How can the aspects of cognitive presence be used in a training scenario for designing learning activities and active student involvement?*

The methodology involved the design of a training scenario where interaction with embodied conversational agents was used to increase student's ability to make strategic decisions during a cyberattack that aims to knock out important IT systems. Then a heuristic evaluation of the learning framework was done during a cognitive walkthrough of the prototype.

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The training scenario for competency development [RQ1] involved initial situational awareness during a ransomware attack against a hospital. It was required that the participants from the crisis response team are familiar with real-time information gathering during an emergency, interpret the information gathered and anticipate how an incident will develop. The lesson was called "Rädd eller beredd – Använda dialogträning för att träna krisledarskap i kommuner" [Afraid or Prepared – Using Dialogue Training to Practice Crisis Leadership in Municipalities] and the topic is part of emergency preparedness in municipalities stipulated by the Swedish Civil Contingencies Agency (Swedish Government 2006, SFS 2006:544). The initial result indicated that the creation of online learning can initially take time to create for the teacher, but will be worth the effort since the lesson can be re-used and become a scalable solution. It was also suggested that reflection-on-action and evaluation of outcomes are methods that work well with online learning, since digital tools and methods can support this type of investigation. The prototype was developed with the application Fictive Reality and was used to facilitate fast-paced choices and improve the level of performance from practice, i.e. skills development rather than extending the repertoire, i.e. knowing.

To investigate the design of learning activities [RQ2], we used four ways of application from the webpage 20 Ways to Create Teaching Presence Online from the University of Virginia (2020). These selected ways have been linked to the four phases of cognitive presence in the following order:

- Design discussion prompts and deep dive into engaged discussions to create the triggering event phase of cognitive presence
- Use roleplaying activities to illustrate multiple points to allow the exploration phase of cognitive presence
- Have students lead discussions to promote the integration phase of cognitive presence
- Provide frequent opportunities for feedback and testing to reach the resolution phase of cognitive presence

The outcome of from the heuristic evaluation was that ECAs can be used to simulate real-time exploration and inquiry similar to human face-to-face interaction. I agree with the experts that the synchronous mode is often fast-paced and tends to encourage a more informal use of disciplinary knowledge. Our experience from this study suggest that students need instructions and guidance to identify concepts or principles that will occur during the learning process, which has also been mentioned in the blogpost by Bates (2020). The evaluation also concluded that the synchronous mode will benefit from being recorded and followed by a debriefing session to review and reflect on the content discussed. The technical limitations of language processing prevents the interaction from being spontaneous. Since the study was conducted the scripted dialogue training has been improved to be more human-like conversations with the use of large language models (LLM) with machine learning technology (c.f. ChatGPT). For future studies I think it would be interesting to study higher order thinking skills (HOTS). Bates (2022) found that roleplaying is effective for developing comprehension and understanding of concepts and procedures, but he has also

found evidence that they can create barriers to develop ability to train analysis, synthesis and critical thinking.

Keywords: Competency Development, Dialogue Training, Embodied Conversational Agents, Community of Inquiry, Experiential Learning

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