Self-directed Learning Skills in Air-traffic Control Training; An Eye-tracking Approach

Ludo W. van Meeuwen¹,³, Saskia Brand-Gruwel¹, Jeroen J. G. van Merriënboer¹,², Jeano J.P.R. de Bock³, & Paul A. Kirschner¹

¹Open University of the Netherlands, ²Maastricht University, The Netherlands, ³Air Traffic Control, The Netherlands

Introduction

Future changes in aviation technologies require Air-traffic Control (ATC) professionals to be able to adapt to these coming changes in their profession. To be able to adapt to new situations professionals must be able to define learning needs, set learning goals and identify human and material resources (e.g. task selection) to fulfil these needs. These skills are called self-directed learning (SDL) skills Knowles (1975). As a consequence, in ATC training, SDL skills should be developed in an adaptive training system (Van Meeuwen, Brand-Gruwel, Van Merriënboer, & De Bock, 2009). However, in order to self-direct learning, insight into past performance is necessary. It requires a self-assessment from a present situation. Self-assessment can be seen as one of the self-regulated learning (SRL) skills (Zimmerman, 1990). This leaves the following research question to answer: Can we measure the learners SRL skills without disturbing task performance and is there a relation between learners’ SRL-skills during task performance and the quality of their SDL-skills?

Method

Participants are 18 ATC-trainees who performed a 10-minute radar task on the training simulator. Cued retrospective reporting (CRR) was used to measure SRL-skills during task performance. CRR is a verbal reporting procedure based on a cue, in which participants
verbalize their thought processes during task performance after completing the task (Van Gog, Paas, Van Merriëboer, & Witte, 2005). The cue used here comprised the screen playback of the task with recordings of participants’ own eye-movements superimposed onto it. Eye-movements were recorded with a Tobii 1750 remote eye-tracking system. Fill out forms were designed to support the self-assessment and task selection procedure. The quality of task selection was used to measure the SDL-skills.

After task instruction, participants fulfilled the first 50 seconds of the task while their eye-movements were recorded. Next, participants practiced cued retrospective reporting. Then they got the final task instructions and they fulfilled the rest of the ATC task while again their eye-movements were recorded. They filled out the forms about self assessment and task selection and, subsequently, they did their cued retrospective report.

**Results and Discussion**
Voice recordings of CRR were transcribed and the use of SRL skills will be scored. Distinction is made between utterances on task level (e.g., *here you see how I monitor this cluster of traffic*) and utterances on the tasks’ meta-level (i.e., self-regulation skills as to monitor, to adjust and to assess): *I could have chosen to decelerate this plane, but I used another strategy; Here I decided to change the order of arrival since…; This performance of me was terrible.* The method of CRR seems to be very applicable to measure SRL skills without interrupting the task performance. First analysis of the data shows that a majority of the utterances are focused on task level and only a relatively few utterances are made on the meta-level. This is in line with earlier findings where the learners in ATC focus mostly on task performance and hardly take into consideration how a specific performance suits within their learning trajectory (Van Meeuwen, Brand-Gruwel, Van Merriënboer, & De Bock, 2010). Further analysis is still in progress and a continuation of this study will focuses on the development of the learners’ SRL skills in an improved instructional design and measure the development of these skills next to the development of trainees’ domain specific competences. This will lead to the answer on the second part of the research question.

**References**


