

# Self-directed learning skills in air-traffic control training; An eye-tracking approach

Citation for published version (APA):

Van Meeuwen, L., Brand-Gruwel, S., Van Merriënboer, J., Bock, J., & Kirschner, P. A. (2010). *Self-directed learning skills in air-traffic control training; An eye-tracking approach*. Paper presented at 29th European Association for Aviation Psychology Conference, Budapest, Hungary.

## Document status and date:

Published: 01/09/2010

## Document Version:

Peer reviewed version

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

## General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

<https://www.ou.nl/taverne-agreement>

## Take down policy

If you believe that this document breaches copyright please contact us at:

[pure-support@ou.nl](mailto:pure-support@ou.nl)

providing details and we will investigate your claim.

Downloaded from <https://research.ou.nl/> on date: 16 May. 2025

Open Universiteit  
[www.ou.nl](http://www.ou.nl)



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

Ludo W. van Meeuwen<sup>1,3</sup>, Saskia Brand-Gruwel<sup>1</sup>, Jeroen J. G. van Merriënboer<sup>1,2</sup>, Jeano J.P.R. de Bock<sup>3</sup>, & Paul A. Kirschner<sup>1</sup>

<sup>1</sup>Open University of the Netherlands, <sup>2</sup>Maastricht University, The Netherlands, <sup>3</sup>Air 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 in to 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.

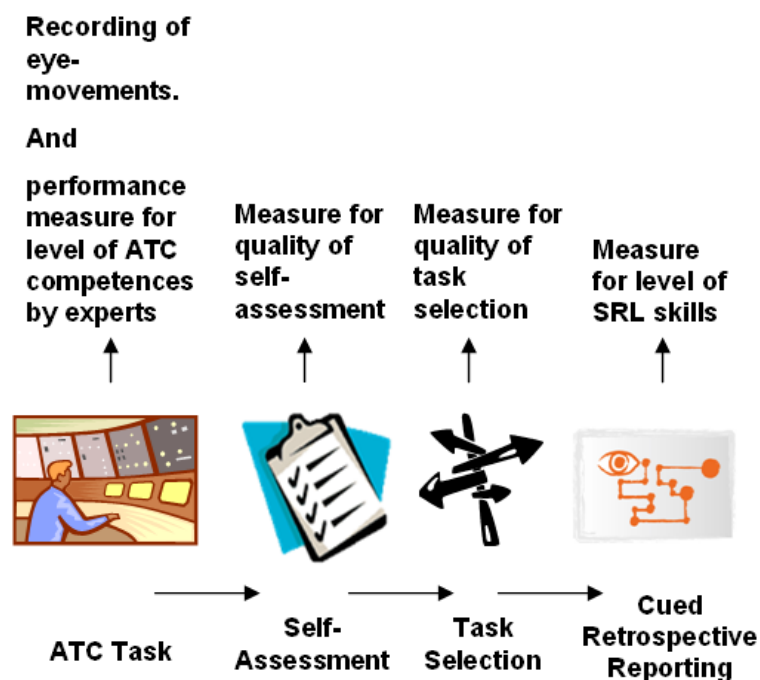


Figure 1

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 focus 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

- Knowles, M. S. (1975). *Self-directed learning*. Chicago: Follett publishing company.
- Van Gog, T., Paas, F., Van Merriënboer, J. J. G., & Witte, P. (2005). Uncovering the Problem-Solving Process: Cued Retrospective Reporting Versus Concurrent and Retrospective Reporting. *Journal of Experimental Psychology: Applied*, 11, 237-244.
- Van Meeuwen, L.W., Brand-Gruwel, S., Van Merriënboer, J. J. G., & De Bock, J.J.P.R. (2009, August). Defining and Training Self-Directed Learning Skills in Cognitively Complex and Dynamic Learning Environments. Poster presented at 13<sup>th</sup> Biennial Conference for Research on Learning and Instruction of EARLI, Amsterdam, The Netherlands.

- Van Meeuwen, L. W., Brand-Gruwel, S., Van Merriënboer, J. J. G., De Bock, J. J. P. R., & Kirschner, P.A., (2010, August). *Indicators for Successful Learning in Air Traffic Control Training*. Paper presented at the 5th EARLI SIG 14 Learning and Professional Development Conference.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational psychologist*, 25(1), 3-17.