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### Perspectives on an integrated computer learning environment

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# Contents of the CD-ROM

The included CD-ROM, which is an integral part of the thesis, contains

- the full papers that were summarized and referred to,
- instructional materials of some of the presented case studies, and
- the electronic version of this thesis.

## List of Full Papers

Below I chronologically list the full papers that were summarized and referred to in this thesis and that are available on the included CD-ROM.

### 2000

- Heck, A. (2000). COACH:  $\beta$ -tool in spe en nu al inzetbaar bij wiskunde. [COACH: Math and science tool in the making and already usable for mathematics]. *Nieuwe Wiskrant*, 19(4), 40–46.
- Heck, A. (2000). COACH: An environment where mathematics meets science and technology. In W. Maull & J. Sharp (Eds.), *Electronic Proceedings of ICTMT 4*, Plymouth, 1999. University of Plymouth (CD-ROM).
- Heck, A. (2000). Een computerwerkplaats voor wiskunde [A computer working environment for mathematics]. In J. Van de Craats (Ed.), *Vakantiecursus 2000: Is wiskunde nog wel mensenwerk?* [Summer Course 2000: Is Mathematics Still Human Work?] (pp. 65–90). Amsterdam: CWI Syllabus 48.

### 2001

- Heck, A. (2001). Variables in computer algebra, mathematics, and science. *The International Journal of Computer Algebra in Mathematics Education*, 8(3), 195–221.

### 2002

- Ellermeijer, T., & Heck, A. (2002). Differences between the use of mathematical entities in mathematics and physics and the consequences for an integrated learning environment. In M. Michelini & M. Cobal (Eds.), *Developing Formal Thinking in Physics*, Proceedings of the first international GIREP seminar, 2-6 September 2001, University of Udine, Italy (pp. 52–72). Udine: Rorum, Editrice Universitaria Udinese srl.

- Heck, A. (2002). A versatile environment for active learners and teachers. In G. Goodell, (Ed.), *Proceedings of ICTCM 13* (pp. 165–169). Boston: Addison-Wesley.
- Heck, A. (2002). Gewichtige wiskunde in de klas [Weighty mathematics in the classroom]. In J. Van de Craats (Ed.), *Vakantie cursus 2002: Wiskunde en Gezondheid* [Summer Course 2002: Mathematics and Health] (pp. 77–114). Amsterdam: CWI Syllabus 50.
- Heck, A., & Holleman, A. (2002). Modelling human growth. In M. Borovcnik & H. Kautschitsch (Eds.), *Technology in Mathematics Teaching Proceedings of the ICTMT 5 in Klagenfurt, 2001*, Schriftenreihe Didaktik der Mathematik v. 25 (pp. 405–408). Vienna: öbv&hpt Verlagsgesellschaft.
- Heck, A., & Holleman, A. (2002). Investigating bridges and hanging chains. In M. Borovcnik & H. Kautschitsch (Eds.), *Technology in Mathematics Teaching Proceedings of the ICTMT 5 in Klagenfurt 2001*, Schriftenreihe Didaktik der Mathematik v. 25 (pp. 409–412). Vienna: öbv&hpt Verlagsgesellschaft.

### 2003

- Ellermeijer, T., & Heck, A. (2003). Walk like a physicist: An example of authentic education. In: *Physics in New Fields*, Electronic Proceedings of GIREP 2002. Retrieved March 19, 2010, from <http://pinf.fysik.lu.se/abstracts/fullText/148.pdf>
- Heck, A., & Holleman, A. (2003). Walk like a mathematician: An example of authentic education. In T. Triandafillidis & K. Hatzikiriakou (Eds.), *Technology in Mathematics Teaching*, Proceedings of ICTMT 6 (pp. 380–387). Athens: New Technologies Publications.
- Van den Camp, W., & Heck, A. (2003). Survival analysis by students. In T. Triandafillidis & K. Hatzikiriakou (Eds.), *Technology in Mathematics Teaching*, Proceedings of ICTMT 6 (pp. 388–394). Athens: New Technologies Publications.

### 2004

- Heck, A. (2004). Met een schuine blik [With a sidelong glance]. *Nieuwe Wiskrant*, 23(3), 29–32.
- Heck, A. (2004). Een gewichtig model [a weighty model]. *Nieuwe Wiskrant*, 23(4), 46–52.
- Heck, A. (2004). Wiskundig broeden op een ei [Mathematical brooding over an egg]. *Nieuwe Wiskrant*, 24(1), 4–13.
- Heck, A. (2004). Een andere draai aan een duik [A twist to a dive]. *Signaal*, 26, 6–9.
- Heck, A. (2004). *Sinusoidal Function Fitting and Spectral Estimation*. Internal technical report. AMSTEL Institute, University of Amsterdam.
- Heck, A., & Holleman, A. (2004). Modelling human growth. Extended paper in M. Borovcnik & H. Kautschitsch (Eds.), *Electronic Proceedings of ICTMT 5, Klagenfurt 2001*. Vienna: öbv&hpt Verlagsgesellschaft (CD-ROM).
- Heck, A., & Holleman, A. (2004). A practical investigation task with the computer at secondary school: Bridges and hanging chains. Extended paper in M. Borovcnik & H. Kautschitsch (Eds.), *Electronic Proceedings of ICTMT 5, Klagenfurt 2001*. Vienna: öbv&hpt Verlagsgesellschaft (CD-ROM).
- Van den Camp, W., & Heck, A. (2004). Wat heb je aan het gemiddelde? [How useful is an average?]. *Nieuwe Wiskrant*, 24(2), 33–38.

### 2005

- Heck, A., & Uylings, P. (2005). Yoyo Joy. In F. Olivero & R. Sutherland (Eds.), *Visions of Mathematics Education: Embedding Technology in Learning*, Proceedings of ICTMT 7, Vol. 2 (pp. 237–244). Bristol, UK: University of Bristol.

Uylings, P., & Heck, A. (2005). Capturing the real world in the classroom. In F. Olivero & R. Sutherland (Eds.), *Visions of Mathematics Education: Embedding Technology in Learning*, Proceedings of ICTMT 7, Vol. 2 (pp. 138–146). Bristol, UK: University of Bristol.

## 2006

Heck, A., & Uylings, P. (2006). Capturing the real world in the classroom, *The International Journal for Technology in Mathematics Education*, 13(3), 107–116.

## 2007

Heck, A. (2007). Modeling intake and clearance of alcohol in humans. In E. Milková & P. Prazák (Eds.), *Electronic Proceedings of ICTMT 8*, Hradec Králové: University of Hradec Králové (CD-ROM).

Heck, A. (2007). Modeling intake and clearance of alcohol in humans. *Electronic Journal of Mathematics and Technology*, 1(3), 232–244. Retrieved September 12, 2008, from <http://php.radford.edu/~ejmt/>

Heck, A. (2007). Getting drunk and sober again. In E. van den Berg, T. Ellermeijer, & O. Slooten (Eds.), *Modelling in Physics and Physics Education*, Electronic Proceedings of GIREP 2006. Amsterdam: AMSTEL Institute, University of Amsterdam. Retrieved May 12, 2011, from <http://www.girep.org/proceedings/proceedings.html?volume=20>

Heck, A. (2007). Modelleren van bruggen en bogen [Modeling bridges and chains]. *Nieuwe Wiskrant*, 27(1), 42–52.

Heck, A. (2007). Een verdiepingsoopdracht over de getijdenbeweging [A practical investigation about tidal movement]. *Signaal*, 28, 26–31.

Heck, A., & Bruidegom, B. (2007). Bridging between contexts and concepts: How data video and computer modelling can help. In D. Benzie & M. Iding (Eds.), *Proceedings of IFIP Conference on Informatics, Mathematics, and ICT: a 'golden triangle'*, Boston, MA, USA.

Heck, A., & Dorenbos, V. (2007). Het bloed krupt waar het niet gaan kan [Blood will tell]. *Signaal*, 28, 18–21.

## 2008

Heck, A. (2008). Wiskundige CSI [Mathematical CSI]. *Euclides*, 83(7), 353–356.

Heck, A. (2008). Een wiskundige thriller [A mathematical thriller]. *Signaal*, 29, 6–8.

Heck, A. (2008). Een gewichtig model [A weighty model]. *Signaal*, 29, 22–23.

Heck, A. (2008). Mathematical brooding over an egg. *Loc*i (August 2008), DOI:10.4169/loci002842

Heck, A. (2008). Wis- en natuurkunde van hardlopen [Mathematics and Physics of Running]. In Werkgroep Natuurkunde Didactiek (red.), *Docent in Ontwikkeling*, Verslag Woudschotenconferentie, Noordwijkerhout, 2008.

Heck, A. (2008). Stuiteren tussen probleemsituatie en vakkennis: Hoe een veelzijdige ICT-omgeving het modellerenproces kan ondersteunen [Bouncing between problem situation and content knowledge: How a versatile ICT environment could support the modeling process]. Unpublished manuscript.

Heck, A., & Van Dongen, C. (2008). Gait analysis by high school students. *Physics Education*, 43(3), 284–290.

Van Gastel, L., Heck, A., Uylings, P. (2008). What goes up must come down: Modeling of tidal movement by students. In E. van den Berg, T. Ellermeijer, & O. Slooten (Eds.), *Modelling in Physics and Physics Education*, Proceedings of GIREP 2006 (pp. 286–298). Amsterdam: AMSTEL Institute, Universiteit van Amsterdam.

**2009**

- Heck, A. (2009). Bringing reality into the classroom. *Teaching Mathematics and its Applications*, 28(4), 164–179.
- Heck, A. (2009). Dit programma wordt u aangeboden door AMSTEL [This program is offered to you by AMSTEL]. *Nieuwe Wiskrant*, 29(2), 37–45.
- Heck, A., & Ellermeijer, T. (2009). Giving students the run of sprinting models. *American Journal of Physics*, 77(11), 1028–1038.
- Heck, A., Houwing, H., & De Beurs, C. (2009). An e-class in action: Experiences with ICT intensive teaching and learning of discrete dynamical models at secondary school. *Electronic Journal of e-Learning*, 7(1), 41–52.
- Heck, A., Houwing, H., Val, J., Ekimova, L. & Papageorgiou, G. (2009). Design and implementation of an e-class about continuous dynamical systems. In *e-Proceedings of the 6th JEM Workshop*, August 2009, Aachen. Retrieved October 18, 2009, from [www.jem-thematic.net/en/node/1401](http://www.jem-thematic.net/en/node/1401)
- Heck, A., Kędzierska, E., & Ellermeijer, T. (2009). Design and implementation of an integrated computer working environment for doing mathematics and science. *Journal of Computers in Mathematics and Science Teaching*, 28(2), 147–161.
- Heck, A., Kędzierska, E., Rogers, L., & Chmurska, M. (2009). Acid-base titration curves in an integrated computer learning environment. *Chemical Educator*, 14(4), 164–174.
- Heck, A., & Uylings, P. (2009). Hoe hangt een Slinky? [How does a Slinky hang?]. *Signaal*, 30, 9–13.
- Heck, A., & Vonk, R. (2009). You must make money move. *Physics Education*, 44(2), 188–194.

**2010**

- Heck, A. (2010). Modelling in cross-disciplinary authentic student research projects. *International Journal for Technology in Mathematics Education*, 17(3), 115–120.
- Heck, A., & Ellermeijer, T. (2010). Mathematics assistants: Meeting the needs of secondary school physics education. *Acta Didactica Napocensia*, 3(2), 17–34.
- Heck, A., Ellermeijer, T., & Kędzierska, E. (2010). Striking results with bouncing balls. In C. P. Constantinou & N. Papadouris (Eds.), *Physics Curriculum Design, Development and Validation*, Proceedings of GIREP 2008 (pp. 190–208). Nicosia: University of Cyprus.
- Heck, A., Ellermeijer, T., & Kędzierska, E. (2010). Authentic student research projects on physics and the human body. In C. P. Constantinou & N. Papadouris (Eds.), *Physics Curriculum Design, Development and Validation*. Electronic Proceedings of GIREP 2008. Retrieved May 12, 2011, from <http://lsg.ucy.ac.cy/girep2008/>
- Heck, A., & Uylings, P. (2010). In a hurry to work with high-speed video at school. *The Physics Teacher*, 48(3), 176–181.
- Heck, A., & Uylings, P. (2010). Een sprong voorwaarts met wis- en natuurkunde [A jump forwards with mathematics and physics], *Nieuwe Wiskrant*, 29(3), 37–47.
- Heck, A., Uylings, P., & Kędzierska, E. (2010). Understanding physics of bungee jumping. *Physics Education*, 45(1), 63–72.
- Heck, A., Uylings, P., Kędzierska, E., & Ellermeijer, T. (2010). Cross-disciplinary, authentic student research projects. In A. N. Fhloinn, S. Brady, S. Breen, P. van Kempen & L. McCormack (Eds.), *Inquiry-Based Learning: Facilitating Authentic Learning Experiences in Science and Mathematics*, Proceedings SMEC 2010 (pp. 40–45). Dublin: CASTeL.

**2011**

Heck, A. (2011). Modeling Chemical Kinetics Graphically. Submitted.

Heck, A., Knobbe, D., Nijdam, N., Slooten, O., & Uylings, P. (2011). Exploring the giant circle on the high bar with ICT tools. *Proceedings of ICTMT 10*. Portsmouth, UK (accepted).

Heck, A., & Uylings, P. (2011). A jump forwards with mathematics and physics. *Proceedings of ICTMT 10*. Portsmouth, UK (accepted).

## List of Instructional Materials

The CD-ROM also contains instructional materials of some of the case studies presented in this thesis. Topics are:

- Human growth.
- Shapes of main spans of bridges and hanging chains.
- Human locomotion.
- Spreadsheet-based data handling (survival analysis, weather data).
- Quantitative pharmacokinetics.
- Bouncing balls.
- Numerical approximation of roots.