Tutorials in der Mechanik – Konzeptionelles Verständnis fördern mithilfe fachdidaktisch entwickelter Lehrmaterialien

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20.03.2018

MINT-Kolleg, Stuttgart

TUHH
Technische Universität Hamburg

ENGINEERING EDUCATION RESEARCH
FACHDIDAKTIK DER INGENIEUR-WISSENSCHAFTEN

LERNZIELE

Teilnehmende des Workshops sind anschließend in der Lage...

- essentielle **Elemente** zu benennen, die beim Einsatz von Tutorials zu beachten sind,
- den **Entwicklungsprozess** dieser Lehrmaterialien zu beschreiben, sowie
- Daten zur **Wirksamkeitsanalyse** zu interpretieren und diskutieren.

Ziel dieses Workshops ist es explizit *nicht*, selbst Tutorials erstellen zu können.

Auszug aus der Kurzbeschreibung dieses Workshops

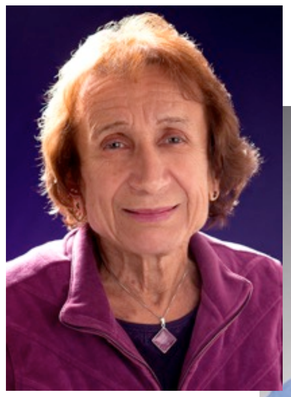
TUTORIALS (TUTORIEN)

Elemente

Entwicklungsprozess

Wirksamkeitsanalyse

Lillian C. McDermott

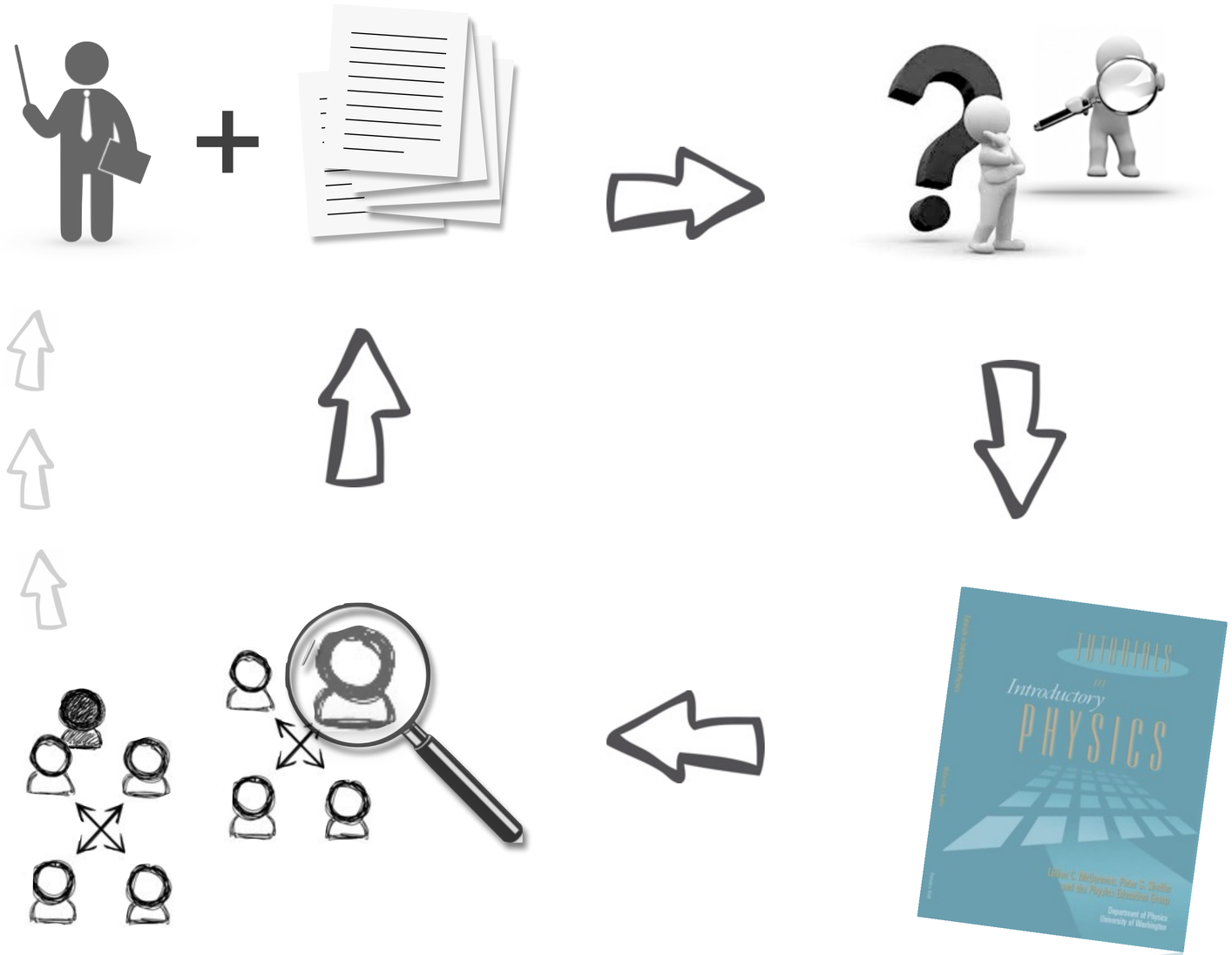


Peter S. Shaffer

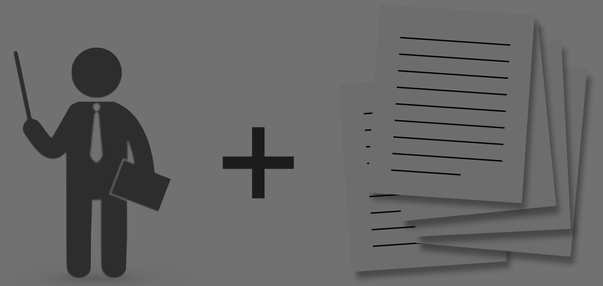
Christian H. Kautz

Bildnachweise:
Lilian und Peter: washington.edu
Christian: eigene Aufnahme
Bücher: amazon.de

ENTWICKLUNGSPROZESS

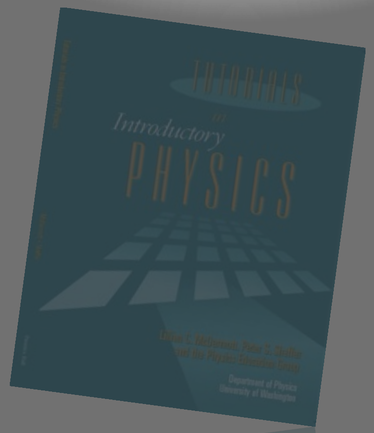


ENTWICKLUNGSPROZESS

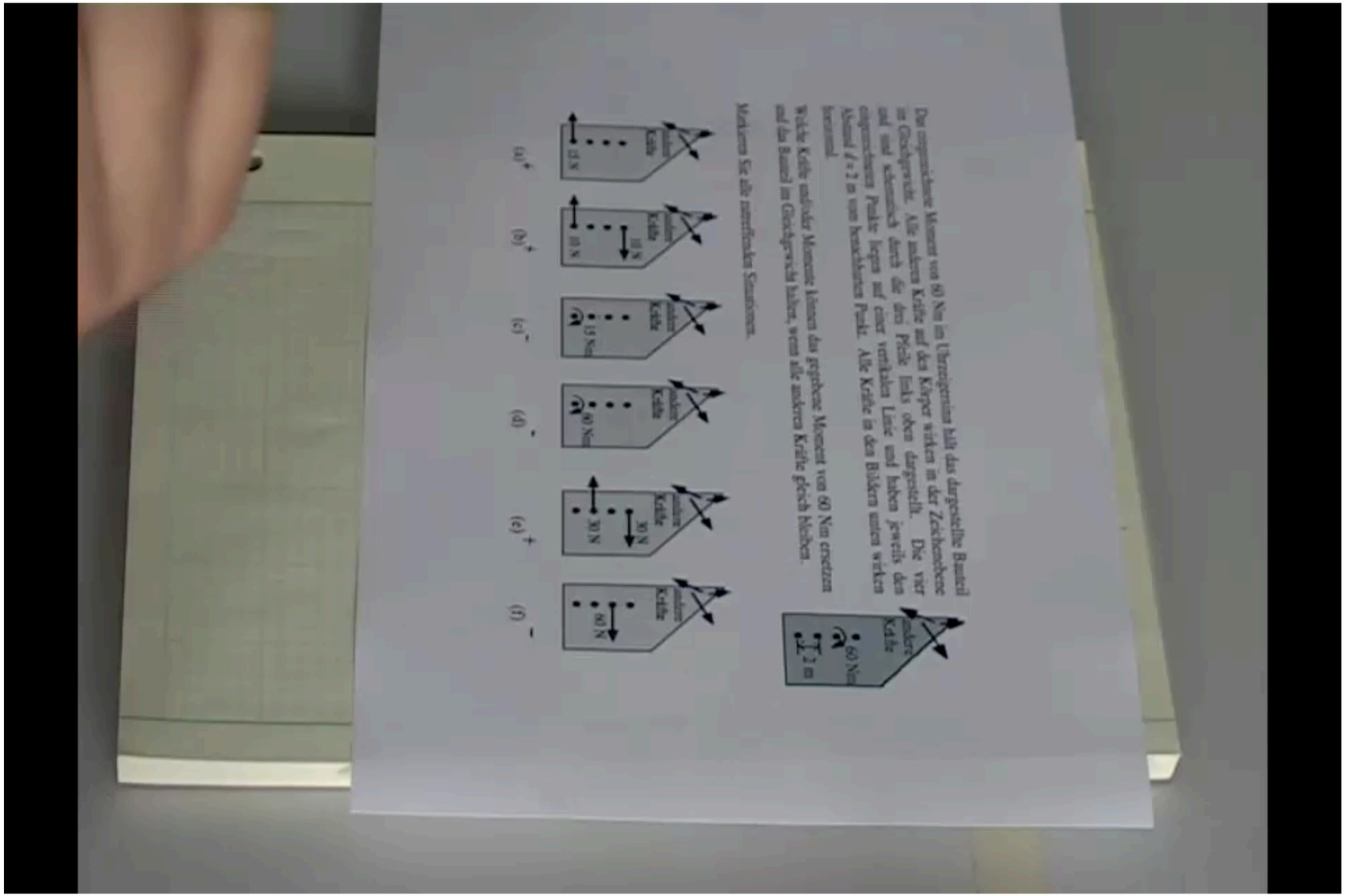


Identifikation von Schwierigkeiten bei Studierenden

- Analyse von schriftlichen Arbeiten der Studierenden
- Diagnostiktests
- Interviews



INTERVIEW



Elemente

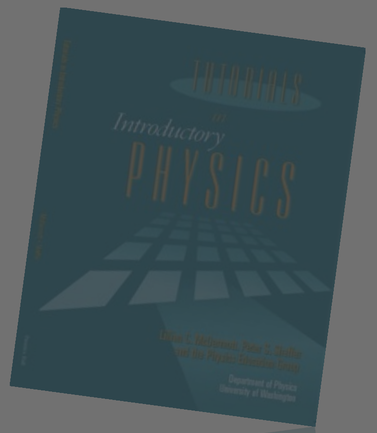
Entwicklungsprozess

Wirksamkeitsanalyse

ENTWICKLUNGSPROZESS

Überprüfung der Wirksamkeit

- Gezielte Klausuraufgaben
- Diagnostiktests
- Clicker-Fragen

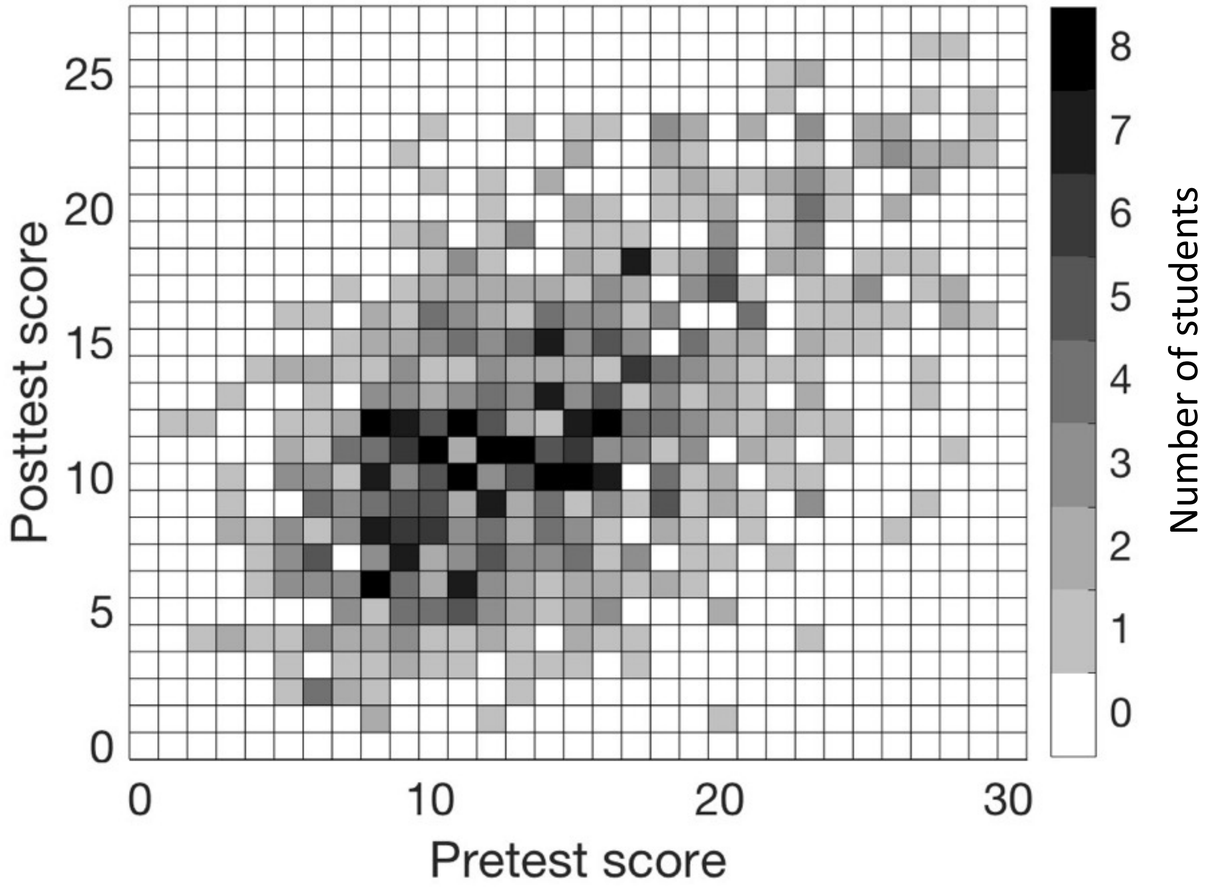


EINGANGS- UND AUSGANGSTESTS

	Jahr		FCI (Vortest) [%]*	CATS (Nachtest) [%]*	N**
trad. Lehre	2005-2006		53	44	136
	2006-2007		51	36	61
	2007-2008		51	34	123
	2008-2009		50	30	227
	Mittelwert	(gewichtet)	51	35	
Tutorials	**2009-2010**		49	44	305
	2010-2011		44	42	369
	2011-2012	+JITT	49	46	465
	2012-2013	+JITT	42	42	363
	2013-2014		41	38	171
	Mittelwert	(gewichtet)	46	44	
trad. Lehre	2014-2015		40	30	247
	2015-2016		39	32	321
	2016-2017		38	31	218
	Mittelwert	(gewichtet)	39	31	

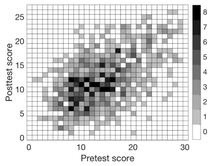
*Die Standardabweichungen der Mittelwerte liegen alle unter einem Prozentpunkt.
**Es wurden nur Studierende gezählt, welche beide Tests gemacht haben.

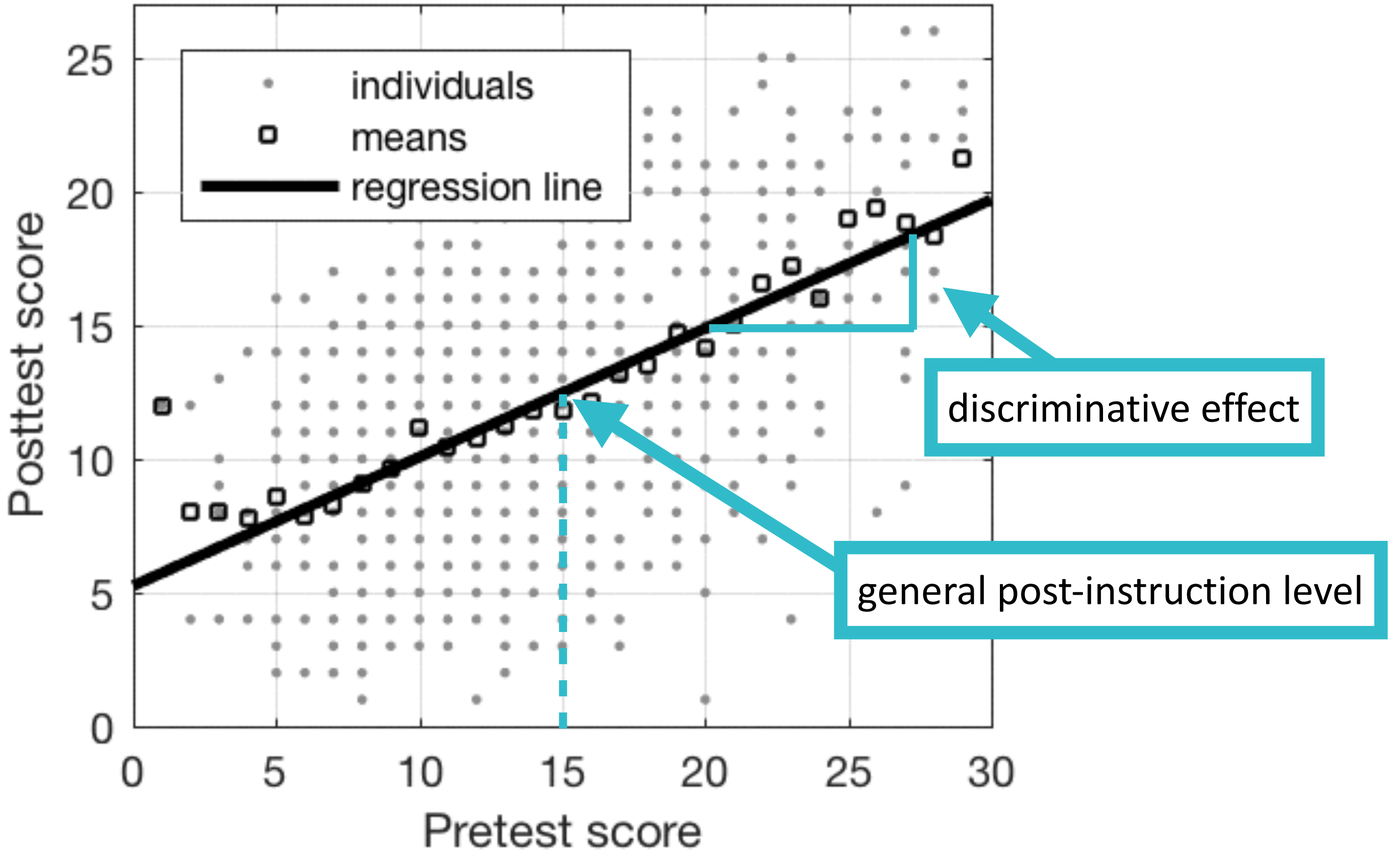
ROHDATEN



J. Direnga, D. Timmermann, F. Kieckhäfer, and C. Kautz, ‘Refining the WLR: Quantifying the difference in learning success between courses’, in *Research in Engineering Education Symposium 2017 (REES2017)*, Bogotá, Columbia, 2017.

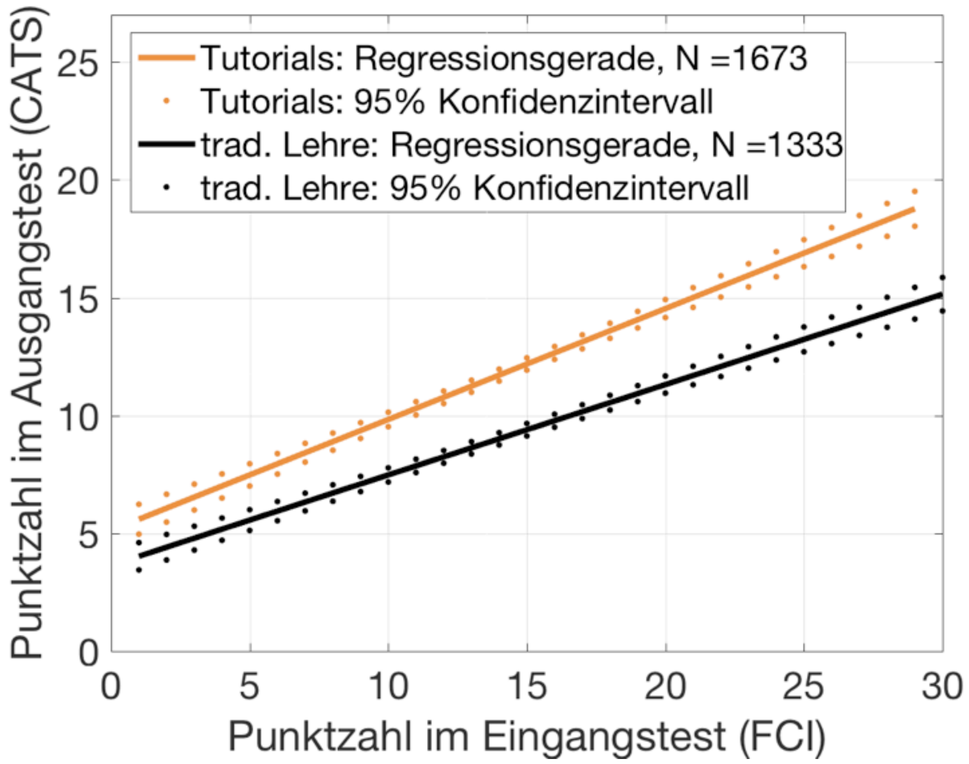
DISCRIMINATIVE LEARNING GAIN





J. Direnga, D. Timmermann, F. Kieckhäfer, and C. Kautz, 'Refining the WLR: Quantifying the difference in learning success between courses', in *Research in Engineering Education Symposium 2017 (REES2017)*, Bogotá, Columbia, 2017.

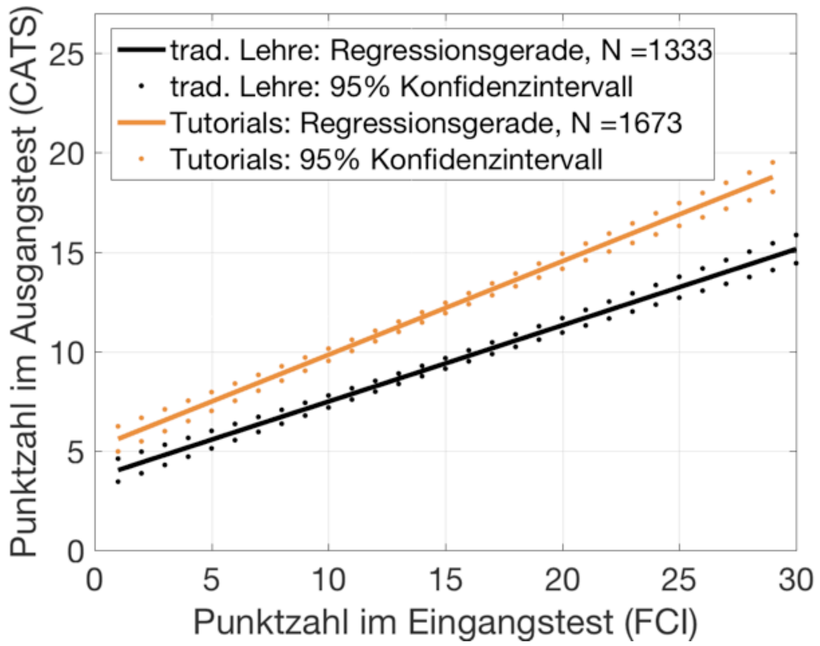
WIRKSAMKEIT VON TUTORIALS



- 2,78 +/- 0,53 Punkte mehr im General Post-instruction Level
- Discriminative Effect bei Tutorials um 0,09 +/- 0,09 höher
- keine Überschneidung

J. Direnga, D. Timmermann, F. Kieckhäfer, and C. Kautz, 'Refining the WLR: Quantifying the difference in learning success between courses', in *Research in Engineering Education Symposium 2017 (REES2017)*, Bogotá, Columbia, 2017.

SCHLUSSFOLGERUNGEN



- Im Vergleich zu traditioneller Lehre führen Tutorials bei Studierenden *aller* Eingangsniveaus (gemessen an der FCI-Punktzahl) im Mittel zu besserem Konzeptverständnis (gemessen an der CATS Punktzahl).
- Darüber hinaus profitieren Studierende mit höheren Eingangsniveaus im Mittel *noch mehr* von den Tutorials als Studierende mit niedrigen Eingangsniveaus.

J. Direnga, D. Timmermann, F. Kieckhäfer, and C. Kautz, 'Refining the WLR: Quantifying the difference in learning success between courses', in *Research in Engineering Education Symposium 2017 (REES2017)*, Bogotá, Columbia, 2017.

WEITERE STUDIEN

Study of TA's ability to implement the *Tutorials in Introductory Physics* and student conceptual understanding

Kathleen M. Koenig, University of Cincinnati
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Robert J. Endorf, University of Cincinnati
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PHYSICAL REVIEW SPECIAL TOPICS - PHYSICS EDUCATION RESEARCH **3**, 010104 (2007)

Effectiveness of different tutorial recitation teaching methods and its implications for TA training

Kathleen M. Koenig,[1] Robert J. Endorf,[2] and Gregory A. Braun[3]
[1]*Department of Physics, Wright State University, Dayton, Ohio 45435, USA*
[2]*Department of Physics, University of Cincinnati, Cincinnati, Ohio 45221, USA*
[3]*Department of Physics, Xavier University, Cincinnati, Ohio 45207, USA*
(Received 18 August 2006; published 15 May 2007)

We present results from a comparative study of student understanding for students who attended recitation classes that used different teaching methods. Student volunteers from our introductory calculus-based physics course attended a special recitation class that was taught using one of four different teaching methods. A total of 272 students were divided into approximately equal groups for each method. Students in each class were taught the same topic, "Changes in Energy and Momentum," from *Tutorials in Introductory Physics*. The different teaching methods varied in the amount of student and teacher engagement. Student understanding was evaluated through pre- and post-tests. Our results demonstrate the importance of the instructor's role in teaching recitation classes. The most effective teaching method was for students working in cooperative learning groups with the instructors questioning the groups using Socratic dialogue. In addition, we investigated student preferences for modes of instruction through an open-ended survey. Our results provide guidance and evidence for the teaching methods that should be emphasized in training course instructors.

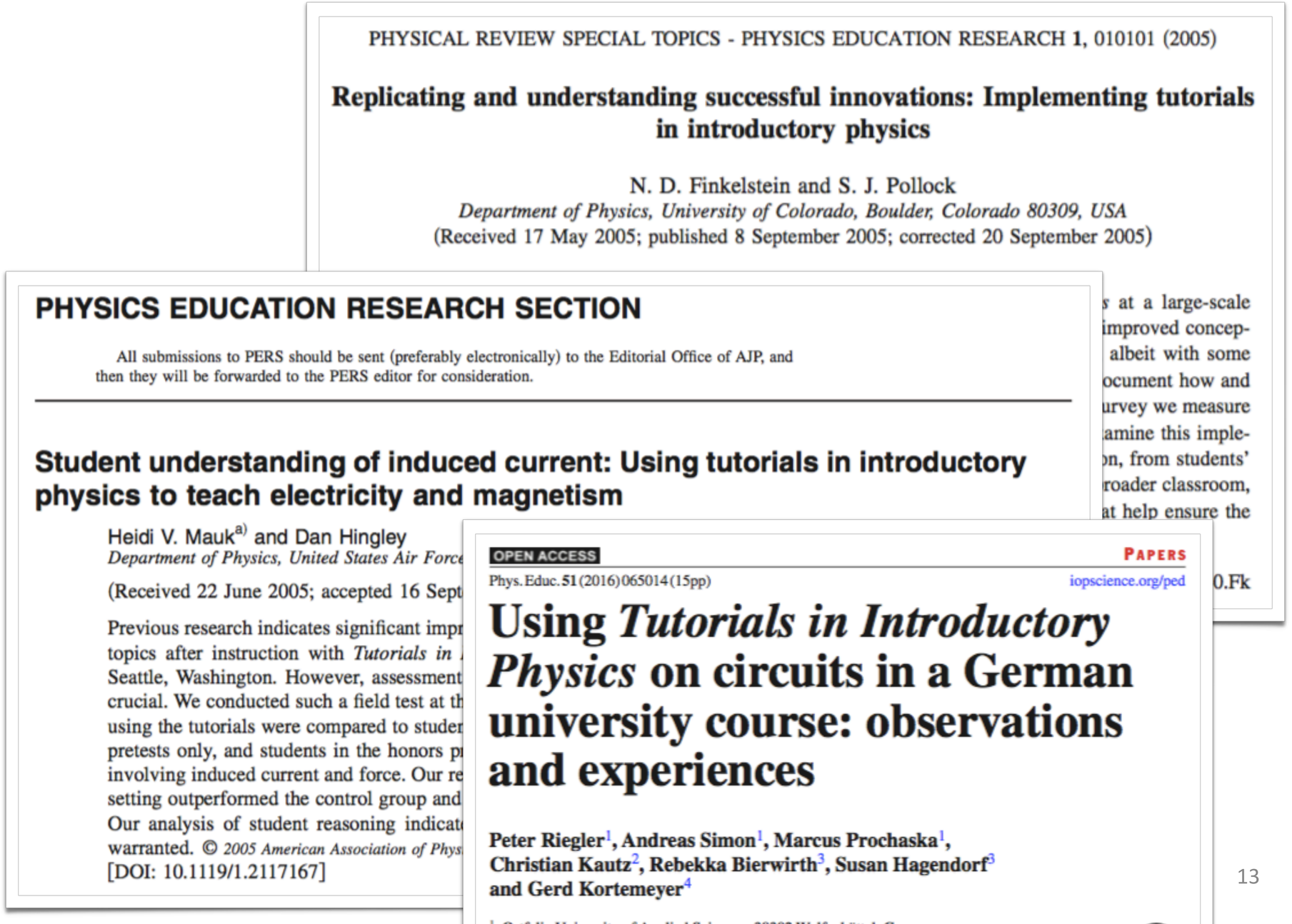
DOI: 10.1103/PhysRevSTPER.3.010104 PACS number(s): 01.40.−d, 01.40.gb, 01.40.J−

WEITERE STUDIEN

Elemente

Entwicklungsprozess

Wirksamkeitsanalyse



PHYSICAL REVIEW SPECIAL TOPICS - PHYSICS EDUCATION RESEARCH 1, 010101 (2005)

Replicating and understanding successful innovations: Implementing tutorials in introductory physics

N. D. Finkelstein and S. J. Pollock
Department of Physics, University of Colorado, Boulder, Colorado 80309, USA
(Received 17 May 2005; published 8 September 2005; corrected 20 September 2005)

PHYSICS EDUCATION RESEARCH SECTION

All submissions to PERS should be sent (preferably electronically) to the Editorial Office of AJP, and then they will be forwarded to the PERS editor for consideration.

Student understanding of induced current: Using tutorials in introductory physics to teach electricity and magnetism

Heidi V. Mauk[a)] and Dan Hingley
Department of Physics, United States Air Force

(Received 22 June 2005; accepted 16 Sept

Previous research indicates significant impr
topics after instruction with *Tutorials in*
Seattle, Washington. However, assessment
crucial. We conducted such a field test at th
using the tutorials were compared to studer
pretests only, and students in the honors pr
involving induced current and force. Our re
setting outperformed the control group and
Our analysis of student reasoning indicat
warranted. © *2005 American Association of Phys*
[DOI: 10.1119/1.2117167]

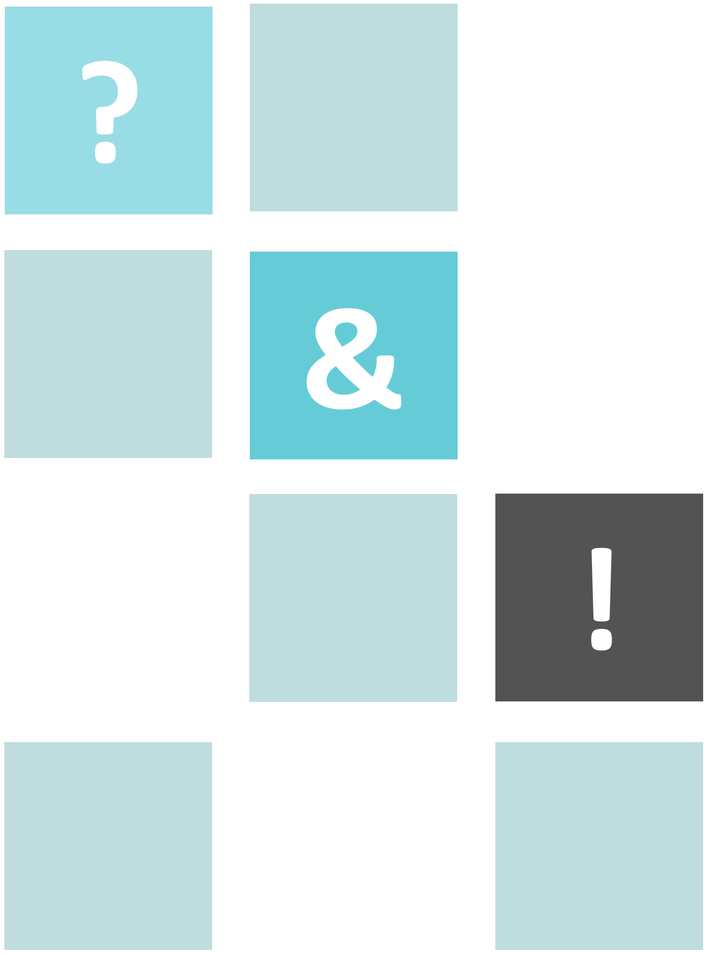
OPEN ACCESS PAPERS

Phys. Educ. **51** (2016) 065014 (15pp) iopscience.org/ped

Using *Tutorials in Introductory Physics* on circuits in a German university course: observations and experiences

Peter Riegler[1], Andreas Simon[1], Marcus Prochaska[1], Christian Kautz[2], Rebekka Bierwirth[3], Susan Hagendorf[3] and Gerd Kortemeyer[4]

Interviewpartner gesucht!



- Thema: Beurteilung des CATS
- Zielgruppe: Statik-Dozenten
- Dauer: ca. 45 Minuten
- auch telefonisch möglich

Kontakt

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Wissenschaftliche Mitarbeiterin

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