School of
Health Professions
Education

2018
2020

SHE Mid-term evaluation report
Appendices
Part 1 (Compulsory and Additional information)

Faculty of Health, Medicine and Life Sciences
Maastricht University Medical Centre (MUMC+)

Maastricht University Maastricht UMC+

Part 1 - Appendices

1. Compulsory

2. Additional information

Appendix 1a

Factual evidence on research quality

| Top 10 research output in terms impact

Social media attention for SHE research products based on Altmetric analyses[1]. *Note: All these publications belong to the top 5% of all research outputs scored by Altmetric.*

Article	Altmetric score	Tweets	Blogs
Sweller, J., van Merrienboer, J. J. G., & Paas, F. (2019). Cognitive Architecture and Instructional Design: 20 Years Later. *Educational Psychology Review*, *31*(2), 261-292. https://doi.org/10.1007/s10648-019-09465-5	395	583	1
Sukhera, J., Milne, A., Teunissen, P. W., Lingard, L., & Watling, C. (2018). Adaptive reinventing: implicit bias and the co-construction of social change. *Advances in Health Sciences Education*, *23*(3), 587-599. https://doi.org/10.1007/s10459-018-9816-3	115	62	1
Artino, A. R., Driessen, E. W., & Maggio, L. A. (2019). Ethical Shades of Gray: International Frequency of Scientific Misconduct and Questionable Research Practices in Health Professions Education. *Academic Medicine*, *94*(1), 76-84. https://doi.org/10.1097/ACM.0000000000002412	78	162	1
Biwer, F., Oude Egbrink, M., Aalten, P., & de Bruin, A. (2020). Fostering Effective Learning Strategies in Higher Education – A Mixed-Methods Study. *Journal of Applied Research in Memory and Cognition*, *9*(2), 186-203. https://doi.org/10.1016/j.jarmac.2020.03.004	66	104	
Sukhera, J., Wodzinski, M., Milne, A., Teunissen, P. W., Lingard, L., & Watling, C. (2019). Implicit Bias and the Feedback Paradox: Exploring How Health Professionals Engage With Feedback While Questioning Its Credibility. *Academic Medicine*, *94*(8), 1204-1210. https://doi.org/10.1097/ACM.0000000000002782	63	68	
Berkhout, J. J., Helmich, E., Teunissen, P. W., van der Vleuten, C. P. M., & Jaarsma, A. D. C. (2018). Context matters when striving to promote active and lifelong learning in medical education. *Medical Education*, *52*(1), 34-44. https://doi.org/10.1111/medu.13463	55	94	
White, M. R., Braund, H., Howes, D., Egan, R., Gegenfurtner, A., van Merrienboer, J. J. G., & Szulewski, A. (2018). Getting Inside the Expert's Head: An Analysis of Physician Cognitive Processes During Trauma Resuscitations. *Annals of Emergency Medicine*, *72*(3), 289-298. https://doi.org/10.1016/j.annemergmed.2018.03.005	53	101	
Ramani, S., Konings, K. D., Mann, K. V., Pisarski, E. E., & van der Vleuten, C. P. M. (2018). About Politeness, Face, and Feedback: Exploring Resident and Faculty Perceptions of How Institutional Feedback Culture Influences Feedback Practices. *Academic Medicine*, *93*(9), 1348 - 1358. https://doi.org/10.1097/ACM.0000000000002193	44	24	2

[1] Altmetric is a platform that tracks and analyses the online activity around scholarly research outputs. It gathers data on outreach activities through (social) media, user statistics from reference managers, and mentions in patents and policy documents.

Mogre, V., Stevens, F. C. J., Aryee, P. A., Amalba, A., & Scherpbier, A. J. J. A. (2018). Why nutrition education is inadequate in the medical curriculum: a qualitative study of students' perspectives on barriers and strategies. *BMC Medical Education*, *18*, [26]. https://doi.org/10.1186/s12909-018-1130-5	36	63	
Ramani, S., Konings, K. D., Ginsburg, S., & van der Vleuten, C. P. M. (2019). Twelve tips to promote a feedback culture with a growth mind-set: Swinging the feedback pendulum from recipes to relationships. *Medical Teacher*, *41*(6), 625-631. https://doi.org/10.1080/0142159X.2018.1432850	33	62	

| Top 10 publications 2010-2018

based on CNCI* (Category Normalized Citation Impact)

Article	CNCI score
van Merrienboer, J. J. G., & Sweller, J. (2010). Cognitive load theory in health professional education: design principles and strategies. *Medical Education*, *44*(1), 85-93. https://doi.org/10.1111/j.1365-2923.2009.03498.x	23.3
Kirschner, P. A., & van Merrienboer, J. J. G. (2013). Do Learners Really Know Best? Urban Legends in Education. *Educational Psychologist*, *48*(3), 169-183. https://doi.org/10.1080/00461520.2013.804395	21.7
ten Cate, O., Hart, D., Ankel, F., Busari, J., Englander, R., Glasgow, N., Holmboe, E., Iobst, W., Lovell, E., Snell, L. S., Touchie, C., Van Melle, E., & Wycliffe-Jones, K. (2016). Entrustment Decision Making in Clinical Training. *Academic Medicine*, *91*(2), 191-198. https://doi.org/10.1097/ACM.0000000000001044	20.7
Leppink, J., Paas, F., van Gog, T., van der Vleuten, C., & van Merrienboer, J. J. G. (2014). Effects of pairs of problems and examples on task performance and different types of cognitive load. *Learning and Instruction*, *30*, 32-42. https://doi.org/10.1016/j.learninstruc.2013.12.001	18.5
Schmidt, H. G., Rotgans, J. I., & Yew, E. H. J. (2011). The process of problem-based learning: what works and why. *Medical Education*, *45*(8), 792-806. https://doi.org/10.1111/j.1365-2923.2011.04035.x	15.5
Young, J. Q., Van Merrienboer, J., Durning, S., & Ten Cate, O. (2014). Cognitive Load Theory: Implications for medical education: AMEE Guide No. 86. *Medical Teacher*, *36*(5), 371-384. https://doi.org/10.3109/0142159X.2014.889290	15.2
Schuwirth, L. W. T., & Van der Vleuten, C. P. M. (2011). Programmatic assessment: From assessment of learning to assessment for learning. *Medical Teacher*, *33*(6), 478-485. https://doi.org/10.3109/0142159X.2011.565828	14.6
van Zundert, M., Sluijsmans, D., & van Merrienboer, J. (2010). Effective peer assessment processes: Research findings and future directions. *Learning and Instruction*, *20*(4), 270-279. https://doi.org/10.1016/j.learninstruc.2009.08.004	13.5
Yardley, S., Teunissen, P. W., & Dornan, T. (2012). Experiential learning: Transforming theory into practice. *Medical Teacher*, *34*(2), 161-164. https://doi.org/10.3109/0142159X.2012.643264	11.5
Bok, H. G. J., Teunissen, P. W., Favier, R. P., Rietbroek, N. J., Theyse, L. F. H., Brommer, H., Haarhuis, J. C. M., van Beukelen, P., van der Vleuten, C. P. M., & Jaarsma, D. A. D. C. (2013). Programmatic assessment of competency-based workplace learning: when theory meets practice. *BMC Medical Education*, *13*, [123]. https://doi.org/10.1186/1472-6920-13-123	11.2

*The Category Normalized Citation Impact of a document is calculated by dividing the actual citation count on InCites by an expected citation rate for documents with the same document type, year of publication, and subject area. Note that we do not include recent publications (2018-2020) since citation-based metrics will be unreliable for documents of this age.

| 10 most prominent awards obtained by SHE staff - 2018-2020

Award	Year
De Jong, N. Maastricht University Wynand Wijnen Education prize.	2018
Meeuwissen, S. N. E. Best Research Paper award AMEE (International Association for Medical Education), Basel, Switzerland.	2018
Van der Vleuten, C. P. M. Presidential Chair 2018-2019, School of Medicine, University of California San Francisco, USA	2018
Frambach, J. M. Suez Canal University Award. Awarded in appreciation of contributing to the advancement of education at Suez Canal University, Egypt.	2019
De Bruin, A.B.H. KIPRIME Fellow. Selected for the Karolinska Institutet Prize for Research in Medical Education Fellows Programme	2019
Teunissen, P. KIPRIME Fellow. Selected for the Karolinska Institutet Prize for Research in Medical Education Fellows Programme	2019
Stalmeijer, R.E. Medical Education Choice Critics Award.	2019
Sehlbach, C. Best Research Paper Award NVMO.	2019
Dolmans, D. Listed as top 2% scientist within her discipline for career-long citation impact until the end of 2019. Loannidis, J. P., Boyack, K. W., & Baas, J. (2020). Updated science-wide author databases of standardized citation indicators. *PLoS Biology, 18*(10), e3000918.	2020
Regehr G. Awarded Karolinska Institutet Prize for Research in Medical Education.	2020

Appendix 1b

Factual evidence on relevance to society

| Capacity building for Health Professions Education

Through SHE Collaborates (SHEC) we share our knowledge and experience in Health Professions Education worldwide to strengthen healthcare for all. We aim to collaborate in long term projects as change to innovative education takes time. The need for strengthening is often felt in the area of education as well as in the professional domain, hence the collaboration projects combine education and health content. Depending on the domain we involve consultants from SHE and OI as well as staff from e.g. Health Promotion, Family Medicine, Psychology from Maastricht UMC+. In case the expertise we are looking for is not available within Maastricht University we connect to other educational institutes, NGO's, Health care providers, etc. SHE Collaborates staff is capable of formulating project proposals, execute projects and contribute to the content as we are a team with a health and education background.

| Active SHEC Project Collaborations 2018 - 2020

ASIA

Indonesia
Ministry of Health/Multiple universities in Indonesia
Building Capacity for Indonesian Primary Care Physician Teachers

Nepal
Dhulikhel hospital, department of community programmes
"Sexual and reproductive health courses for school-aged children (8-19 years of age) in Nepal"

Philippines
Social Innovation in Health Initiative (SIHI) – Philippines, University of the Philippines College of Medicine and University of the Philippines School of Health Sciences *'Social Innovation for Sexual and Reproductive Health and Rights'*

MIDDLE EAST

Iraq
University of Fallujah, Cihan University and Al Mansour University College
'Improving education and employment prospects of vulnerable youth in Iraq through blended and virtual education' In cooperation with Luminus Technical University College (LTUC) in Jordan

Kingdom of Saudi Arabia
Batterjee Medical College, Jeddah, Kingdom of Saudi Arabia
In cooperation with 'Strengthening Student Centered Learning in the Medicine Programme'

United Arab Emirates
Batterjee Medical College, Dubai-UAE
'Designing and implementing a new Medical college'

Yemen
University of Science and Technology Yemen, Sana'a
Strengthen professional training programme in Nursing education
In cooperation with Zuyd University for Applied Sciences

University of Aden - Aden
Integrating Water, Sanitation and Hygiene (WASH) into the training course curriculum of the College of Medicine in Aden University
In cooperation with Innovator for Training and Consultancies (ITC) Yemen

EUROPE

Malta
EDU, Europe's first digital Institution of Higher Education
"*EDU Medical and Maastricht University cooperate to ensure quality of teaching Medicine*"

Portugal
Universidade Católica Portuguesa (UCP)
"*Adopting the Maastricht Medical Curriculum in a new medical programme at UCP*"

Poland
Lublin University "*Tailor made trajectory in preparation for PBL implementation*"

Slovenia
Ljubaljana University *"Strengthening medical skills education"*

Societal impact; two long term examples
Enabling learning - In 2015 North Coast Medical Training College in Mtwapa, Kenya approached us to train there staff in student centered learning approach. Together with two Kenyan graduates from the MHPE we co-designed a course in which learners need to go through an educational paradigm shift from 'teaching' (transfer of information and skills) to 'enabling learning' (helping others acquire the knowledge and skills needed for professional performance). This course was originally designed as a blended course covering 16 weeks with a workload of 1 day per week. After the first pilot, it was decided to extend the course duration to give the participants more time to practise new educational approaches in their ongoing classes. End 2020 participant in Amref International University, Kenya as well as Makeni University and School of Midwifery Makeni, Sierra Leone have enrolled. The course has been upgraded to Higher Diploma Level and is currently waiting for accreditation in Kenya. It is a 'contextual translation' of the knowledge we gained through SHE, to apply in a low resource practice in the Global South. Testimonial from one of the participants: "Before I started this programme I was unconsciously incompetent. I thought that I was doing very well as a teacher. My job was to go to class, 'deliver' and walk out. Whether my students got it or not was not my concern. I saw myself as a knowledge bank. I am now born again as far as enabling learning is concerned. I no longer see myself as the knowledge bank, but as co-learner in the process of teaching. I no longer try to impress my students with what I know, but look for ways to make them learn what I know."

Family Medicine - Educational reform towards more student oriented learning and health care reform towards more community oriented care has always been advocated by Maastricht University. Long term collaborations that started with Moi University in Eldoret, Kenya in 2002 and Gadjah Mada University in Yogyakarta, Indonesia in 2006 in the area of Problem Based Learning also contained elements of community based learning. SHE Collaborates contributed in both countries towards the development of a new medical specialty programme: Family Medicine in Kenya and 'Doctor Keluarga' in Indonedia. In both countries this development will have great impact on the accessibility and affordability for primary health care for millions of people.

Selection of media exposure and publications resulting from SHE Collaborates projects

General

Six essential learnings for education & training in crisis situations | Nuffic
www.maastrichtuniversity.nl/news/innovative-education-conflict-areas
We zijn open! - We zijn open! - Maastricht University
Innovatief onderwijs in conflictgebieden - nieuws - Maastricht University
"Ik weet niet of ze is gevlucht, ondergedoken of dat ze überhaupt nog leeft" > Observant Online
SHE Collaborates On the Road 101 www.youtube.com/watch?v=JZzMFgC6pjM
SHE Collaborates - On the Road 102 www.youtube.com/watch?v=fqMjYNee-Wk

Philippines

https://socialinnovationinhealth.org/wp-content/uploads/2020/12/SIHI_Q1Q32020-compressed-1.pdf

Kenya

Twee decennia ondersteuning opleiding huisartsengeneeskunde in Kenya – WHIG
E-learning at North Coast Medical Training College, Mtwapa, Kenya, 2020
www.youtube.com/watch?v=l7U1cj0i72s
OKP (Nuffic) project opening: North Coast Medical Training College, Mtwapa, Kenya
www.youtube.com/watch?v=QYlpzrkriTs

South Sudan

OKP-TMT.18/00357 Maridi Health Sciences Institute, South Sudan
www.youtube.com/watch?v=nCdxPLAdVWE&t=5s

Ethiopia

Problem Based Learning (PBL) in Ethiopia www.youtube.com/watch?v=0t00mVV0KBQ

| List of websites that feature SHE work prominently

Website	Goal
www.medsimresearch.org	Website of the International Community of Research on Medical Simulation (IRESIM), co-coordinated by SHE PhD student Joy Lee.
www.pasemeco.nl	Website of the Pasemeco project: Improving palliative care education for our future doctors.
www.programmatischtoetsen.nl	Website of the Dutch learning network on programmatic assessment.
www.safepat.eu/en	Website of the Safepat project: Developing excellence in patient safety in cross-border regions.
www.studysmartpbl.com	Website of the Study Smart programme: An evidence-informed study skills training.
www.tensteps.info	Website of the book 'Ten Steps to Complex Learning' (Van Merriënboer & Kirscher, 2018)
www.4cid.org	Website of the 4C/ID model by Van Merriënboer.
https://adaptatwork.nl	Webiste on practice-based research project in higher education on the development of adaptive expertise in work-based learning contexts.

| 10 most prominent invited keynote presentations given by SHE staff at (inter)national conferences - 2018-2020

Keynotes	Year
Van Merrienboer, J. J. G. Framing Educational Research Initiatives at an Academic Institution. Annual Conference of the Association for Dental Education in Europe (ADEE). Oslo, Norway.	2018
Van Merrienboer, J. J. G. An Instructional Design Perspective on Research Based Learning. Annual Conference of the Gesellschaft für Medizinische Ausbildung (GMA). Vienna, Austria.	2018
De Bruin, A.B.H. Self-judgment as a key to life-long learning. Annual Conference of the Gesellschaft für Medizinische Ausbildung (GMA). Vienna, Austria.	2018
Teunissen, P. W. Laveren tussen regels en ruimte [Navigating between rules and space]. Annual Conference of Dutch Medical Education Association (NVMO), November 2018, Egmond aan Zee.	2018
Teunissen, P. W. & Sherbino J. CBME: Are we getting any closer to the promised land? Plenary debate at the Canadian Conference on Medical Education (CCME), Halifax, Canada.	2018
Van der Vleuten, C.P.M. Learning driving assessment: Let's rethink assessment on more time. 18th Ottawa Conference & International Conference on Medical Education. Abu Dhabi, United Arab Emirates.	2018
Stalmeijer, R. E. It takes a village – exploring the potential of health care professionals in the training of residents. Annual Conference of the Australia & New Zealand Association for Health Professions Education (ANZAPHE), Canberra, Australia.	2019
Driessen, E. Do portfolios have a future? Royal College Veterinary Surgeons, London. UK.	2019
Ilgen, J. Uncertainty, confidence, and calibration. European Diagnostic Errors in Medicine Conference. Padova, Italy.*Conference cancelled due to COVID-19 pandemic.	2020
De Bruin, A.B.H. Grenzen aan het zelf in zelf-regulatie [Boundaries to the self in self-regulation]. Annual Conference of Dutch Medical Education Association (NVMO), Leiden, The Netherlands.	2020

Appendix 1c

Research staff, funding and the duration/success rates of the PhD programme

| Research staff

Table 1 Research staff

	2018		2019		2020	
School of Health Professions Education	# / fte	F/M	# / fte	F/M	# / fte	F/M
Scientific staff FHML[1]	35 / 8,80	15/20	38 / 9,90	19/19	39 / 10,40	21/18
Scientific staff academic hospital	0 / 0	-	0 / 0	-	0 / 0	-
Postdocs[2]	6 / 3,10	5/1	9 / 4,10	7/2	7 / 2,40	5/2
Internal PhD-students[3]	14 / 12,80	11/3	14 / 13,60	11/3	11 / 9,40	8/3
Collaborates staff	8 / 5,5	5/3	8 / 5,60	6/2	8 / 5,65	6/2
Total research staff[4]	**63 / 30,20**	**36/27**	**69 / 33,20**	**43/26**	**65 / 27,85**	**40/25**
Support staff (research)[5]	8 / 5,97	3/5	4 / 2,40	3/1	1 / 1,00	1/0
Support staff (managerial)[6]	9 / 3,10	5/4	8 / 2,77	5/3	7 / 2,74	4/3
Total support staff	17 / 9,07	8/9	12 / 5,17	8/4	8 / 3,74	5/3
Total staff incl academic hospital	**80 / 39,27**	**44/36**	**81 / 38,37**	**51/30**	**73 / 31,59**	**45/28**
Total staff excl academic hospital	**80 / 39,27**	**44/36**	**81 / 38,37**	**51/30**	**73 / 31,59**	**45/28**
External PhD candidates[7]	64		67		80	
Honorary professor[8]	0		0		1	
Visiting fellows/professors[9]	7		8		9	

#: Number of persons active on the research unit research activities on 31-dec of any year
fte: Sum of actual fte-factors (in fulltime equivalents) labelled on the research unit research activities on 31-dec on any year
F/M: number of females and males
Note 1: Comparable with WOPI-categories HGL, UHD and UD; tenured and non-tenured staff appointed at the FHML.
Note 2: Comparable with WOPI-category 'Onderzoeker' (1, 2, 3, 4), with completed PhD, not belonging to scientific staff (with WOPI-categories HGL, UHD and UD)
Note 3: Standard PhD (employed). In 2015, SHE has invested in internal PhD-students. These PhD-students have started finishing their PhD's as from 2019; therefore, the table shows a decrease of internal PhD-students.
Note 4: The table shows a graduate decrease of total research staff, this is mostly due to the decrease of Internal PhD-students (see note 3)
Note 5: All support staff working on research (research assistants, lab technicians, and other support staff not working at the management office). SHE Bytes (a set of activities to develop educational software) activities have been phased out due to a number of reasons, financial viability and a refocus on SHE's core activities being the most important ones. Therefore, we can see a significant decrease of research support staff over the past years. This involves the software development staff of SHE Bytes.
Note 6: Support staff working at the School's management office including the scientific director
Note 7: External PhD (externally or internally funded but not employed)
Note 8: Scientific staff, employed unpaired professor
Note 9: Visiting fellows are researchers/professors who visit the School for a period of typically one week up to three months to work with Schools staff members.

| Funding

Table 2 Funding

	2018	2019	2020
School of Health Professions Education	fte / %	fte / %	fte / %
Funding:			
Direct funding[1]	15,35 / 50,8	17,9 / 53,9	14,35 / 51,5
Research grants[2]	5,7 / 18,9	6,65 / 20,1	5,10 / 18,3
Contract research[3]	4,70 / 15,6	4,88 / 14,7	4,71 / 16,9
Other[4]	4,45 / 14,7	3,76 / 11,3	3,69 / 13,3
Total funding	**30,20 / 100**	**33,19 / 100**	**27,85 / 100**
Expenditure:			
Personnel costs	k€3.363,3	k€2.745,7	k€2.691,4
Other costs	k€2.153,6	k€1.298,9	k€1.372,4
Total expenditure	**k€5.516,9**	**k€4,044,6**	**k€4.063,8**

Note 1: Direct funding by FHML/ Maastricht University ('basis financiering' / lump sum budget).
Note 2: Research grants obtained in national scientific competition (e.g. grants from NWO, ZonMw and KNAW)
Note 3: Research contracts for specific research projects obtained from external organisations, such as industry, governmental ministries, European organisations, including ERC, and charitable organisations
Note 4: Funds that do not fit into the other categories.
Note 5: The funding in fte includes the total research staff but excludes the academic hospital-staff

| Success rates PhD candidates

Table 3 Duration and success rates of Standard PhD Candidates[a]

Enrolment				**Success rates (#/%)**						
Starting year	**(male / female)**		**Total**	**Graduated in year 4 or earlier**	**Graduated in year 5**	**Graduated in year 6**	**Graduated in year 7 or later**	**Total graduated**	**Not yet finished**	**Discontinued**
	M	**F**								
2010	0	1	1	0/0%	0/0%	1/100%	0/0%	1/100%	0/0%	0/0%
2011	1	2	3	0/0%	1/33%	2/67%	0/0%	3/100%	0/0%	0/0%
2012	0	1	1	0/0%	1/100%	0/0%	0/0%	1/100%	0/0%	0/0%
2013	0	2	2	0/0%	1/50%	0/0%	1/50%	2/100%	0/0%	0/0%
2014	0	1	1	0/0%	0/0%	0/0%	1/100%	1/100%	0/0%	0/0%
2015	1	7	8	0/0%	3/38%	3/38%	0/0%	6/75%	1/12,5%	1/12,5%
2016	1	2	3	0/0%	0/0%	0/0%	0/0%	0/0%	3/100%	0/0%
Total	**3**	**16**	**19**	**0/0%**	**6/32%**	**6/32%**	**2/11%**	**14/74%**	**4/21%**	**1/5%**

[a]*Standard PhD-candidate with employee status and conducting research with primary aim/obligation to graduate; (AiO, promovendus)*

Table 4 Duration and success rates of all PhD Candidates[b]

Enrolment				Success rates						
Starting year	(male / female)		Total	Graduated in year 4 or earlier	Graduated in year 5	Graduated in year 6	Graduated in year 7 or later	Total graduated	Not yet finished	Discontinued
	M	F								
2010	2	2	4	1 /25%	0/0%	1/25%	1 /25%	3/75%	1 /25%	0 / 0%
2011	3	10	13	3 /23 %	3 / 23%	3 / 23%	2 /15%	11/85%	0 / 0%	2 / 15%
2012	5	5	10	3 /30%	2/20%	1 /10%	2/ 20%	8 /80%	1 /10%	1 /10%
2013	9	11	20	2 /10%	4 /20%	3 /15%	2/10%	11/55%	2 /10 %	6 /30%
2014	8	5	13	2 /15%	3 /23%	1 / 8%	2 /15%	8 /61%	4 /31%	1 /8%
2015	10	13	23	3 /13%	7 /30%	3 /13%	0/0%	13/56%	5 /22%	5 /22%
2016	10	11	21	2/10 %	2 /10 %	0/0%	0/0%	4 /19%	13/62%	4 /19%
Total	**47**	**57**	**104**	**16/15%**	**21/20%**	**12/12%**	**9/9%**	**58/56%**	**27/26%**	**19/18%**

[b]Including PhD candidates from SHE's international PhD programme who usually work part time on their PhD.

Appendix 2a
General information regarding MUMC/FHML

| Maastricht University

Maastricht University was founded in 1976 and is the youngest university of the Netherlands. Maastricht University is characterized by its multidisciplinary and thematic approach to research and learning. Maastricht University was the first Dutch university to set internationalisation as a top priority. More than 50% of the students and more than 40% of the academic staff within Maastricht University come from abroad, making Maastricht University the most international university in the Netherlands,. Maastricht University has extensive international partnership networks and the university encourages international research collaborations. Students and researchers have many opportunities to study and work abroad, and graduates are eagerly sought in the international labour market and research community. All of this has earned UM the Certificate for Quality in Internationalisation (CeQuint), awarded by the European Consortium for Accreditation in higher education (ECA). Maastricht University stands out for its innovative approach to learning and international outlook. With almost 16,000 students and 4,000 staff, Maastricht University offers a wide choice of bachelor's, master's and PhD programmes, all of which are designed to bring out the best in its students. Maastricht University is renowned for its problem-based learning (PBL) system based on a small-scale and student-oriented approach. Education and research at Maastricht University is organised in six faculties:

Faculty of Health, Medicine and Life Sciences
Faculty of Law
School of Business and Economics
Faculty of Humanities and Sciences
Faculty of Arts and Social Sciences
Faculty of Psychology and Neuroscience

| Faculty of Health Medicine and Life Sciences

The Faculty of Health, Medicine and Life Sciences (FHML)[2] is Maastricht University's largest faculty, comprising 65% of the total staff and budget of Maastricht University. The FHML has officially existed since January 1st, 2007, after a merger of the former faculties of Health Sciences and Medicine.

The FHML houses the following graduate Schools:
CAPHRI[3] - Care and Public Health Research Institute,
CARIM[4] - School for Cardiovascular Diseases,
GROW[5] - School for Oncology and Developmental Biology,
MHENS[6] - School for Mental Health and Neuroscience,
NUTRIM[7] - School of Nutrition and Translational Research in Metabolism, and
SHE[8] - School of Health Professions Education.

[2] https://www.maastrichtuniversity.nl/about-um/faculties/faculty-health-medicine-and-life-sciences
[3] https://www.maastrichtuniversity.nl/research/school-caphri-care-and-public-health-research-institute
[4] https://www.maastrichtuniversity.nl/research/school-cardiovascular-diseases
[5] https://www.maastrichtuniversity.nl/research/school-oncology-and-developmental-biology
[6] https://www.maastrichtuniversity.nl/research/school-mental-health-and-neuroscience
[7] https://www.maastrichtuniversity.nl/research/school-nutrition-and-translational-research-metabolism
[8] https://www.maastrichtuniversity.nl/research/school-health-professions-education

Within the FHML there are also two research institutes: The Maastricht MultiModal Molecular Imaging Institute (M4I)[9] and the Maastricht Institute for Technology-Inspired Regenerative Medicine (MERLN)[10].

Within the FHML, the Institute for Education is responsible for the organisation of the educational programmes. The education spans the entire continuum from bachelor's and master's programmes to post academic education (e.g. specialist medical training in the hospital) from health and healthcare to medicine and life sciences.
Each School/institute is managed by a scientific director, who has final responsibility for the overall School/institute policy. The managing director is responsible for the accounting within the School/institute and heads up the School's/institute's management office.
The basic infrastructure of a School encompasses discipline specific departments (core or non-core) each headed by a chair. The department chair is responsible for the quality of the discipline related education and research. Moreover, if it concerns a clinical department the chair is also responsible for the quality of the discipline related patient care. In a matrix organisation, departments house the human resources: support staff, PhD students and scientific staff. Tasks are provided through labelling in Schools and educational programmes. The department chair has the task of acquiring and distributing the tasks over personnel, in concert with the Schools and the Institute for Education. For the research labelling, the policy as from 2016 is that direct government funding research labelling for all tenured research staff is maximised at 0.5fte.

| FHML matrix structure

Process owners within the FHML
The dean of the faculty is legally responsible for all education and research within the FHML. The implementation of this responsibility takes place in a decentralized manner within the Schools and the Institute for Education. The scientific directors of the Schools and the Institute for Education are accountable to the dean. The dean is assisted by the Faculty Board and supported by the Faculty Office, under the direction of the FHML managing director.

Schools
In the Schools, thematic research takes place within a number of research lines/divisions. By training scientists and developing master's programmes related to the School's research, there is a strong interconnection between education and research.
The scientific director of the School is fully responsible for the School's research programme and the training of researchers. Furthermore, s/he is responsible for the content of the master's programmes, which is strongly linked to the School's research programme.
The process owner for research and training of researchers at the School is the scientific director, assisted by the leaders of the research lines/divisions, and, deeper in the organization, principle investigators (PIs), programme- and project leaders.
The FHML has six Schools: CARIM, NUTRIM, GROW, MHeNs, CAPHRI and SHE.

Institute for Education
The Institute for Education is responsible for the development, organisation, administration and implementation of all FHML educational programmes, and has to make sure that a solid internal quality assurance system is in place for these programmes.
The scientific director of the Institute for Education bears full responsibility for the FHML's bachelor's and master's programmes, while the scientific directors of the Schools have a substantive

[9] https://www.maastrichtuniversity.nl/research/maastricht-multimodal-molecular-imaging-institute-0
[10] https://www.maastrichtuniversity.nl/research/institute-technology-inspired-regenerative-medicine

responsibility for the School's research master's programmes. In addition, the scientific director of the Institute for Education is responsible for the internal quality assurance system for the educational programmes within the FHML. The scientific director of the Institute for Education is supported by the educational programme directors, programme coordinators, year coordinators and course coordinators.

Department

The department is responsible for the (quality of the) disciplinary input in education and research and for the development of the discipline. The chair of the department is the process owner for this input and for discipline development. S/He is assisted in this by the senior staff of the department (professors and associate professors). The FHML currently has 44 departments.
As a result of the above defined responsibilities of the various process owners, the roles of department chair, scientific director of a School / Institute and Dean / Board member are mutually incompatible.

The FHML Matrix

The above implies, that the responsibilities for education and research are decentralized within the FHML. A matrix organization fits this approach. The academic staff *('WP – wetenschappelijk personeel'*), excluding PhD students, is appointed to the departments. Based on obtained tasks and roles in research and educational programmes, the School(s) and Institute for Education assign research and education labeling to the academic staff of the department. The chair of the department has the responsibility to obtain tasks and roles (and therefore labeling) and distribute these among the staff, the latter in coordination with the School(s) and the Institute for Education. PhD students, as well as research and educational support staff ('OBP – *onderwijsondersteunend personeel*'), are appointed at the Schools and at the Institute for Education. OBP is being involved in the tasks and roles of the department's WP. For the research support staff, this usually means that the employee has been appointed to the School, but is being placed at a department. The latter also applies to the majority of PhD students. Most educational support staff is at the same time employed by and placed at the Institute for Education. Contrary to the above, some OBP has been appointed by departments directly, for example the secretary(ies) of the department.
The research labeling based on direct funding is capped at 0.5 fte and the basic principle is that academic staff performs educational as well as research tasks. It is possible that individual staff members have a higher research labeling than the maximum 0,5 fte, but only if externally acquired funding is used.

The underlying set of tools

The most important tools for the correct functioning of the FHML matrix organization are the following:

1. the tasks and responsibilities of the various process owners as agreed
2. the integrated system of decentralized allocation of resources with integral management responsibility for the process owners
3. the FHML consultation structure and the planning and control system

Ad 1. The tasks and responsibilities of the process owners have been outlined in one of the previous paragraphs of this memorandum and are anchored in the FHML Faculty Regulations. A system of annual appraisal interviews is linked to these tasks and responsibilities.
Ad 2. The integrated system of decentralized allocation of resources with integral management responsibility is elaborated in the internal budget system and implemented in the faculty budget. The so-called Performance Funding Model Research (*Dutch acronym PBM 'PrestatieBekostigingsModel'*) is used in the internal allocation of resources to Schools. The funding model consists of two parts: a fixed component of resource allocation and a variable component, which is based on the number (and relative share) of PhD graduations per School. The internal allocation of resources *(Dutch*

Acronym IMT 'Interne Middelen Toewijzing') is intended for permanent staff, paid by direct funding[11]. The internal allocation of resources for the Institute of Education is determined in such a way that there is systematically and continuously sufficient funding for the regular training programme.
Ad 3. The main focus lines of research and education are determined by the dean/Faculty Board, based on input received from Schools and the Institute of Education. The underlying strategic considerations are discussed bilaterally in the Board's six-month Planning and Control meeting with the School/Institute for Education and in plenary in the regular (Management) meetings (*'periodiek – management- overleg')* of the Board with the scientific directors and in the meetings of the Board with the department chairs *('Overleg Bestuur Vakgroepen')*. In addition, the 6-year quality assurance cycle (according to SEP protocol) where the Schools are reviewed by an external review committee once every 6 years (preceded by an internal mid-term review after 3 years) is an important instrument for further determining and (re)adjusting the School's strategy. The Faculties' educational programmes are also assessed according to a 6-year cycle by an external committee, managed by the NVAO (Dutch Flemish Accreditation Organization).
Within the FHML there are two Planning and Control levels. At the Faculty level, agreements are made between the Faculty Board and the scientific director of the School/Institute for Education about input of resources and – based on this - the expected output. At the School level the planning and control takes place in the regular (in principle annual) meetings between the scientific director and the chair of the department. In these meetings the scientific quality and societal relevance of the discipline is discussed, including the expected outcome to be achieved as a result of the invested input, both in education and research.

How the matrix works; the scientific director and chair of the department meet on the basis of equality
The meeting between School/Institute and Department, as was described in the former paragraph (the second level of planning and control) leads periodically, in principle once a year, to further determination and/or re-assignment of the formative input of each department in the Schools/Institute for Education.
Changing the formative input needs the approval of the Faculty Board. Usually, there will be agreement between the scientific director of the School and the chair of the department about the way in which formation is to be deployed. In that case, the approval by the Faculty Board is merely a formal confirmation, which is handled by the FHML director on behalf of the Board.
In those cases where there is a difference of opinion between the parties about the deployment of the formation, the Faculty Board will take the final decision, after having taken note of the argumentation from both sides.
An important principle here is, that there will always be an opportunity to change things for the better during a certain period (in principle one year), in case it becomes clear during a Planning and Control meeting that performance is lagging behind in certain areas. In this case, clear agreements will be made about the expected output at the end of this period. Only when these agreements have not been met, there will be reason to proceed with a change in the formative input.

A change in the formative input, for example a reduction in number of staff members (FTEs), will consequently be implemented with a delay of one year, unless the mutation has no direct personnel consequences, due to natural progress, the obtaining of alternative labeling, or available vacancies. In that case implementation can be started immediately. The delay factor offers the opportunity to acquire alternative labeling, for example within one of the other Schools, or within the Institute for Education, in a situation that arises in the event of redundancy.
Acquiring alternative labeling is the joint responsibility of the chair of the department together with the scientific director of the School/Institute. As a lack of alternative labeling during a maximum of one year has a suspensive effect on the employment policy of the department, it is not only the chair

[11] 'Eerste geldstroom'

of the department, but also the School director involved, who has an interest in finding alternative labeling. This means, that also the scientific director has an interest in solving a possible problem of redundancy.

The paragraphs above describe extensively how the matrix works when it is necessary to reduce the number of permanent staff in terms of labeling. Obviously, the procedure described above also works when there is an increase in the labeling. In that case, the challenge lies in the search for complementary labeling in the other domain (research versus education), prompted by the aforementioned principle that research labeling on the basis of direct funding is capped at 0.5 fte, and the aim is that all scientific staff has educational as well as research tasks.
The bilateral consultation structure described above between the chair of the department and the scientific director about the disciplinary commitment in education and research, and the joint responsibility for the way in which changes are dealt with, indicate the equality of those involved within the matrix structure.

This equivalence is furthermore reflected in the fact that the chair of the department, based on her/his responsibility for the development of the discipline, plays an explicit role in determining the content of education and research. This responsibility is especially visible in the participation of the chair in the Schoolcouncil. Furthermore, staff members of the department (including the chair), act in various roles in education and research, such as leaders of research lines, project leaders, programme coordinators, or year and block coordinators. The tasks and responsibilities of the Schoolcouncil are described in the Faculty Regulations and further detailed in the School Regulations.

| PhD

In most countries, a doctoral candidate is considered a student without an employee status. In the Netherlands, internal PhD candidates are traditionally researchers employed by a university to complete a dissertation. External PhD students are not employed but are registered by the university. To start a PhD, the candidate has to have completed a recognized master's degree.
The aim of the PhD training is to complete a dissertation based on original research. In the Netherlands, this requires about four years fulltime of doing research and writing. PhD research publications and the whole dissertation must be original work as candidates are expected to make an original contribution to the body of knowledge in their field of research. Throughout the entire PhD training, PhD candidates work in close collaboration with their supervisors.

The Maastricht University PhD thesis should comprise either a scholarly thesis on a particular subject or a number of separate scholarly papers, all or some of which have already been published in the form of articles and which demonstrate sufficient mutual coherence.

In general, Dutch dissertations are held in high esteem since they live up to the highest academic standards. Once the research is complete the supervisor judges whether the dissertation is ready for publication and oral defence. Then a committee of professors is appointed to read and approve the dissertation and to question the candidate during the traditional, centuries-old oral defence ceremony.

Internal candidates are selected based on their application for a position that is published on the Dutch main website for academic vacancies. External PhD candidates, which are registered and not employed by the university, are recruited in three different ways: 1. supervisors recruit external PhDs from their national and international networks; 2. potential candidates (with or without an obtained scholarship) contact the institute from all over the world or 3. via the contact details of the researchers and PhD coordinator on the website.

| Maastricht UMC+ (More knowledge, better life)

Maastricht University Medical Centre+ is a partnership between Maastricht University Hospital and Maastricht University's FHML. Maastricht UMC+ focuses not only on restoring people to good health but also on helping them stay healthy and improve their health. In addition to tertiary referral care and top clinical patient care, our core tasks are research, education and training, and valorisation. Maastricht UMC+ also provides basic healthcare services for the city of Maastricht and environs. This means that, in cooperation with our network partners, Maastricht UMC+ is uniquely equipped to deliver healthcare services from baseline to tertiary level and thus offer precisely the right care where it is needed, but also to investigate the effects of new healthcare models.
The mission of Maastricht UMC+ is 'To provide the best possible care and improve health in the region by integrating patient care, research and education' under the motto: Healthy Living. Within this mission, there is a strong focus on integrated care and prevention of disease.

To explain the comprehensive approach and complex interaction between research, healthcare, education and training, and valorisation, the Maastricht UMC+ has developed the 'Circle of Innovation©', which basically is a universal visualisation tool that reflects the circular process of knowledge, innovation and societal impact.

Figure 1: Maastricht UMC+ Circle of Innovation©

The 'Circle of Innovation©' shows how our researchers and specialists acquire new knowledge and put it into practice, create value and stimulate healthy living. 'Circles of Innovation©' are the foundation for health promotion in the broadest sense of the word. This method also stimulates collaboration between Schools and institutes, the hospital, different departments, regional health care and patient organisations and other knowledge institutes, governmental organisations and industry.

Concerning the valorisation process, defined as 'The process of creating value from knowledge by making it applicable and available for utilization for economic or societal purposes, and by translating it into new businesses, products, services, or processes', the Maastricht University and Maastricht UMC+ bring all their business development activities in the field of Health and (Life) Sciences to the Brightlands Maastricht Health Campus[12]. As such, the campus is responsible for the entire process, from developing ideas or inventions through financing and guiding new businesses.

[12] https://www.brightlands.com/

Appendix 2b

MUMC-FHML policies with regard to open science, PhD policy and training, academic culture, and human resources policy

| Open Science

In 2019, Maastricht University approved the policy note "Open Science @ UM", which paved the way to: 1. award and remunerate Open Science behaviour, 2. stimulate Open Access publishing, 3. make research data optimally suited for reuse and 4. support and facilitate Open Science. Maastricht University endorses the principles of Open Science and offers its academics support to put these principles into practice to make science "as open as possible, as closed as necessary". The Open Science umbrella covers topics such as:

- FAIR data use: Whenever possible, research data must be Findable, Accessible, Interoperable and Reusable;
- Open Access: Promoting free online access to scientific information, such as publications and data. In this model, the author pays, not the reader;
- Encouraging the unconditional right to reuse research data, modify them, and reshare them;
- Recognizing and rewarding scientists in a different way: Scientists are usually judged by their publication output and the research grants they have acquired. Open Science also stands for recognition and appreciation of other issues such as educational activities, leadership qualities and social impact.

The Maastricht UMC+ actively stimulates the implementation and practice of Open Science in academia. The Maastricht UMC+ supports the principle of Open Access with regard to publications: full and immediate Open Access to publications from publicly funded research. The Maastricht UMC+ follows the ambition of the National Plan Open Science. The leading principle in this regard is that publicly funded research results should also be freely accessible to the public. Within the Maastricht UMC+ there is a library committee that negotiates contracts with publishers (Golden Open Access, Hybrid and Green Open Access). Furthermore, since 2017, publications of Maastricht UMC+ researchers are posted in the public UM research database PURE. Within Maastricht UMC+ an Open Science ambassador is appointed (Dennie Hebels, a project leader from the MERLN Institute). The open science ambassador is a member of the Open Science Community (OSC) Maastricht[13], which is an inter-faculty group that promotes Open Science all throughout Maastricht University. The activities of the OSC are: 1. make Open Science visible at all faculties and departments, 2. organise events and workshops to facilitate implementation of Open Science at all levels of science, 3. answer questions on Open Science, 4. connect with other Open Science Communities in the Netherlands and internationally and 5. facilitate discussion between researchers, departments and faculties on integrating Open Science in everyday research.The Maastricht University Library commits to the Maastricht University policy on Open Access and Open Access publishing. The University Library[14] has developed tools for UM and Maastricht UMC+ researchers to stimulate open science and to assist them in doing

[13] https://www.openscience-maastricht.nl/
[14] https://library.maastrichtuniversity.nl/open-access/

this, such as an Open Access guide[15], an Open Access publishing checklist[16], the service "You share, we take care!"[17]. By signing up for this service, the UB will share and make the paywalled publications findable and accessible to the world.

| PhD Policy and training

General
At the start, each Maastricht University (MU) PhD candidate is requested to fill out a Declaration of Scientific Integrity conform the UM Doctoral Regulation, in which they declare that they took notice of and will adhere to the Netherlands Code of Conduct for Scientific Integrity 2018 and the UM Integrity Code of Conduct. They also immediately start composing their Personal Research Plan (PRP) with a publication plan and feasible planning and a Training and Supervision Plan (TSP) that should contain 20-35 ECTS points. Both should be completed within the first three months and approved by the supervision team and PhD coordinator (and HR for internal PhDs). There are no compulsory courses, as the training trajectory is tailored to the particular project and individual career path. The course offer is organised by the Faculty, UM Staff Career Centre, Language Centre, University Library (most of these are paid for by the Faculty). PhD candidates are also free to choose good quality courses elsewhere or online. Educational and conference expenses are paid from the PhD incentive payments that the supervisory team receives for each successful PhD defence.

Supervision PhD candidates
Professors, and since 2019 also associate professors, have the ius promovendi that gives them the ability to act as supervisors (first promoter) leading a PhD candidate to a successful defence. Each supervisory team consists of at least two supervisors, as laid down in the MU Regulation governing the attainment of doctoral degrees, 2020. Supervisors have a PhD degree and come from different Departments, Schools, MUMC+ or regional hospitals, and institutes in The Netherlands or abroad. Supervisors have a key role in coaching and supporting PhD candidates through the phases in the PhD trajectory. The PhD representatives and PhD coordinator continuously discuss new initiatives at School and Faculty level to contribute to an increased awareness of the mutual needs and expectations of PhD candidates and supervisors, as good, effective, responsive and respectful communication are key contributes to a mutual sphere of trust and inspirational flow and thus to the progress of PhDs and their wellbeing.

Since 2017, FHML offers the four-day course Competence Development for supervisors of PhD candidates. This course is intended for FHML staff who were recently offered a permanent position as assistant (or associate) professor, those with whom a tenure track has been agreed upon, or otherwise identified as future talents for the organisation, and for promising postdocs who start supervising their first PhD candidates. It is provided by an external training bureau that receives exceptionally high evaluations and aims to provide supervisors with tools to further develop their competences, support PhD candidates more effectively to complete their PhD within a reasonable time and to lead them to the labour market.

Since 2019, supervisors have access to the ratings on their performance that are given by their PhD candidates in an anonymous annual survey in PhD TRACK. When a supervisor receives an overall score lower than 7/10 or the progress of the trajectory is scored lower than 7/10, the PhD coordinator receives an email to contact the PhD candidate to offer support.

[15] https://library.maastrichtuniversity.nl/research-support/open-access/guide/
[16] https://library.maastrichtuniversity.nl/oa-publishing-checklist-open-access-tip/?utm_source=mailpoet&utm_medium=email&utm_campaign=library-research-update_618
[17] https://library.maastrichtuniversity.nl/share-your-articles-you-share-we-take-care-open-access/?utm_source=mailpoet&utm_medium=email&utm_campaign=library-research-update_618

Quality assurance and PhD TRACK

To enable PhD candidates to move through their PhD trajectory in a successful way, an online monitoring system TRACK was established. PhD TRACK is a quality management system that actively monitors both the progress of PhD candidates and the quality of the supervision. The quality assurance consists of 8 elements and is complemented by an online PhD monitoring system (PhD TRACK monitoring of PhD trajectories). The aim is to support PhD candidates during their trajectories by reminding them of important milestones, such as signing the Declaration of Scientific Integrity, drawing up and annually revising their TSP and PRP and preparing for their annual appraisal interview by reviewing their working circumstances and the quality of the supervision they receive. Supervisors are supported to actively manage and report on the progress of their PhD projects. This enables FHML to timely detect problems and delay.

PhD TRACK has the following features;

- Registering all categories of PhD candidates, their supervisors, the Schools involved and the Departments and RLs in which they are embedded;
- Collecting research and teaching portfolio's, the Declaration of Scientific Integrity, Training & Supervision Plans and Personal Research Plans and PhD alumni information when they have graduated and half-yearly progress assessments by supervisors;
- Monitoring the satisfaction of PhD candidates on perceived workload, task division and the performance of their supervisors in a confidential annual questionnaire, and the progress of the planning and estimated completion of PhD trajectories by supervisors;
- Producing management information on numbers and types of PhD candidates, success and dropout rates, etc. for the Schools, FHML board and national organisations such as the VSNU.

Selection and admission procedures for PhD candidates

PhD candidates are selected in different ways:

- Internal PhD candidates apply on a vacancy posted at the Dutch main website for academic vacancies (Academic Transfer[18]);
- Supervisors recruit external PhDs from their national and international networks;
- Potential external candidates (sometimes with a Scholarship) contact Schools from all over the world.

Assessment of PhD candidates

The progress of each PhD trajectory is assessed every half year in PhD TRACK by the supervisors. Internal PhD candidates are formally assessed at the end of every PhD-year according to the Dutch Collective Labour Agreement (CAO). The go/no-go interview in the 10th month, in presence of their HR advisor, determines whether the appointment will be extended for the further three years. An information leaflet and the appraisal of their workload and supervisors in the annual TRACK survey helps them to prepare for this interview. External PhD candidates should request for an annual evaluation meeting with their supervisors. All types of PhD candidates have to update their TSP and PRP, including the planning, for this annual meeting and are reminded to do so by an email from PhD TRACK

[18] https://www.academictransfer.com/en/

| Academic culture

Scientific integrity

The Netherlands Code of Conduct for Research Integrity[19] and the UM Code of Conduct on Integrity[20] form the guiding principles for Maastricht UMC+'s integrity policy. Besides these codes, the Maastricht UMC+ has developed 'The Maastricht UMC+ Research Code'[21]. This Code provides those involved in research within the Maastricht UMC+ with a clear description of the rules for ethical and socially responsible conduct in scientific research. Every new researcher (including PhD candidates) who receives his/her contract from the human resources department of the Maastricht UMC+/FHML is informed about the existence of the Maastricht UMC+ Research Code.

The Executive Board of Maastricht University has appointed a counsellor for scientific integrity, who is the contact person for questions or complaints concerning this topic. The counsellor will try to mediate in case of a complaint concerning suspected scientific misconduct. If this is not possible, he will guide the complainant to file the complaint to the Committee for Scientific Integrity, who will then take it further and will advise the Executive Board of Maastricht University.

The University Library has a Similarity Check Service in their Research support portal. The similarity Check Service[22] is a tool to authenticate the own writing, that by the co-author, or by the PhD candidate. The University Library's Similarity Check Service can help all researchers to prevent sloppy referencing or plagiarism.

Maastricht University has a combination of faculty-level and University-level committees to assess the ethical aspects of research proposals and projects. These committees promote ethics and integrity among their students and staff, via local codes, activities and in the teaching programmes. In 2018, the faculty committees were brought together via a Maastricht University Research Ethics and Integrity platform to facilitate sharing of best practices and expertise in this field. It also aims at increasing awareness on research integrity among students and staff by further stimulating discussion on relevant topics in a constructive, engaging and positive manner. Within Maastricht UMC+ the Platform Scientific Integrity (PSI)[23] is installed to create a culture of awareness regarding scientific integrity. Moreover, the goal is to create an approachable and safe environment in which the topic scientific integrity is discussible among all employees involved in scientific activities, including faculty, supportive staff contributing to research, and PhD students, as well as students. The PSI is active since September 2018 and consists of representatives from each School/Institute.

The PSI has set up a list of aspects related to scientific integrity[24]. This list includes information such as links to useful websites/tools regarding scientific integrity. The aim is not only to abide by the principles set out in the Research Code Maastricht UMC+ but also to engage in a broader dialogue about scientific integrity and good practice in research. The overview can be used by all persons involved in scientific activities, including faculty, supportive staff contributing to research, PhD students, as well as students. Moreover, this overview is designed for use by supervisors and PhD students at the start of a PhD trajectory, for discussion throughout the project and during the annual assessments.

[19] https://www.nwo.nl/en/netherlands-code-conduct-research-integrity
[20] https://www.maastrichtuniversity.nl/about-um/organisation/codes-conduct-regulations
[21] https://www.maastrichtuniversity.nl/researchcodeMUMC
[22] https://library.maastrichtuniversity.nl/research-support/similarity-check/
[23] https://www.maastrichtuniversity.nl/platform-scientific-integrity-maastricht-umc
[24] https://www.maastrichtuniversity.nl/about-um/faculties/health-medicine-and-life-sciences/research/scientific-integrity/aspects

To stimulate the discussion about concrete issues and dilemmas related to professionalism and integrity in research the PSI disseminated the Dilemma game[25] (developed by the Erasmus University Rotterdam), to all Schools/Institutes and departments with the advice to play the game and discuss dilemmas in small groups. Moreover, the PSI supports Schools and Institutes within the organisation of interactive workshops on scientific integrity. In 2019-2020 the PSI mainly focused on development of education on scientific integrity for PhD students (and later on for all staff). To reach all the PhD students (both internal and external) the PSI decided to develop an interactive online course on scientific integrity (1 ECTS). The online course will be developed in a Problem Based Learning format and will be tailored to the FHML/Maastricht UMC+ context. The aim of the platform is to have a pilot version of the online module ready in 2021. At the Maastricht University level, a 4 hours workshop with focus on the basic principles of the Netherlands code of Conduct is set up and will be mandatory for all PhD students in their first year. This workshop will be a good introduction to the FHML/Maastricht UMC+ online course.

Because PhD supervisors play a central role in research ethics and scientific integrity of research projects and (should) serve as a role model for their PhD students, the PSI wrote a proposal for the call set out by the UM platform Research Ethics and Integrity in 2019. The grant proposal 'Staff development: getting PhD supervisors on board for research ethics and scientific integrity' was approved. As part of this project, a workshop ethics and integrity within SHE in 2019 was piloted. In February/March 2021 the full workshop is planned to be piloted among PhD supervisors who participated in the BKB in 2020.

Research data Management
See the Maastricht UMC+ Researchcode[26]

Maastricht UMC+/FHML considers it very important to manage data with care and integrity, and to ensure the reuse and verification of research data following principles of FAIR and Open Science. Accurate management of research data is essential in terms of accountability and scientific integrity, but also in terms of better retrieval, sharing, and storage of research data. Maastricht UMC+/FHML follows the principles as defined in the Maastricht University Research Data Management Code[27] of Conduct. This code contains guidelines for the management of research data to safeguard the accessibility of research data and protect it against theft, misuse, damage and loss.
However, additional guidelines apply for research with human material. For these guidelines Maastricht UMC+/FHML has developed a Quality System Research (QSR)[28]. The 'DataHub' unit[29] offers support and facilities for Research Data Management.

The University Library has developed a Research Data Management guide[30] and supports UM and Maastricht UMC+ researchers in Research Data Management (store, archive, retrieve and share data).

Authorship and order of authors
See the Maastricht UMC+ Researchcode

[25] https://www.eur.nl/over-de-eur/beleid-en-reglementen/integriteit/wetenschappelijke-integriteit/dilemmaspel
[26] https://www.maastrichtuniversity.nl/about-um/faculties/health-medicine-and-life-sciences/scientific-integrity
[27] https://www.maastrichtuniversity.nl/research/integrity-ethics/management-research-data
[28] https://qsmumc.ctcm.nl/
[29] https://portal.datahubmaastricht.nl/
[30] https://library.maastrichtuniversity.nl/research-support/rdm/

| Human resources policy

Diversity
Inclusivity is one of the main goals of the Maastricht University Strategic Programme Community at the Core. The MU has appointed an advisory council on diversity and inclusivity in order to support, challenge and inspire the Executive Board in the realization of the UM's mission and strategy. The Advisory Council consists of UM staff, UM students and members not employed by Maastricht University.

Tasks and responsibilities of the Advisory Council:

- acts as an ambassador for diversity and inclusivity, both internally and externally
- issues solicited and unsolicited recommendations in the area of diversity and inclusivity
- proposes new initiatives and consults with external experts where necessary
- advises the Executive Board on the prioritisation of specific diversity and inclusivity policies
- provides advice on projects aimed at gaining qualitative and quantitative insights into the UM community
- provides advice on the allocation of financial resources for research projects and activities
- advises the D&I Office about policy matters and monitors the impact of D&I policies and initiatives
- endorses and promotes the Diversity Charter formulated by the Labour Foundation

The Advisory Council advices the Diversity & Inclusivity Office about policy matters. Constance Sommerey is appointed as the Maastricht University diversity officer. The aim of the UM's D&I Office is 1. diversifying employee and student population and 2. creating an inclusive atmosphere in which all talents and competencies can be mobilised for the well-being of UM community members and for the well-being of the organisation itself. In order to achieve these aims, the D&I Office's work covers four core areas: attracting & retaining talent, fostering cultural change, strengthening diversity competencies and making family- and life-phase friendly HR and Education policies – UM Cares. These four core areas structure the efforts of UM's D&I Policy in the upcoming years. This division offers the possibility to focus on different aspects of our organisation, including recruitment, academic affairs, teaching development, facility management, student services, employer branding, and HR policies.

Talent policy
The Maastricht UMC+/FHML aims to create an environment that enables talents to excel. The talent policy is aimed at both students and staff and is therefore part of the greater Maastricht University and Maastricht UMC+ human resource systems, which focus amongst others on recruitment and retention of academic staff in an increasingly global market, tenure tracks, diversity, ageing of the workforce, succession planning. The overall talent policy aims at identifying and supporting talented staff at all levels. Faculty policy advisors are available for career, CV and grants (Vidi, Vici, Marie Curie, ERC's,…) advice.

Besides some programmes for Bachelor (e.g. Honours programme and Marble) and Master students (e.g. Premium), Maastricht UMC+/FHML offers an internal Kootstra Talent Fellowship programme for PhD students in their transition to postdoc positions. Talented PhD candidates (or researchers in training as a medical specialist/'arts-assistent niet in opleiding') in their final year can apply for the Kootstra Talent Fellowship, to bridge the time between graduation and postdoc position and can be used for writing a postdoc proposal (for example VENI).

Talented postdoc researchers can be offered a Tenure Track programme. Young researchers are given the opportunity to obtain a permanent employment contract as Assistant Professor when they

meet certain criteria, based on output, an independent attitude, acquired funding, personal development and scientific recognition. The programme offers support in this trajectory. Tenure trackers are assessed by an independent committee, before they are offered a staff position.

The Maastricht UMC+ based talent programme ('Toptalenten programma') is intended for top-talents. The aim is to scout potential professors and to offer them a Professorship with a specialised remit (Profileringsleerstoel) with the prospect of moving on to a Structural Chair after assessment of their performance and professional growth potential. Agreements are made with the candidates concerning their scientific development and their personal development and leadership potential. This track includes course work on personal development and leadership skills. Schools/Institutes are invited to nominate suitable candidates. Every 2-3 years a 'Toptalent Review' is organised on the basis of which 8 to 10 candidates are selected.

Fostering Future Leaders[31] is a MU management development programme for employees with the potential to grow into a managerial position within (or outside) UM. Academic leadership is needed to be a successful manager in an academic setting, and this includes managing both academic staff (WP) and administrative and support staff (OBP). The Fostering Future Leaders programme therefore focuses on both academic staff (WP) and administrative and support staff (OBP). In principle, participation in Fostering Future Leaders is possible for employees who perform tasks and responsibilities at the level of job scale 10 or 11.

Fundamentals of Leadership[32] is a MU practical programme with various basic modules for employees who have recently started or will soon start a management position. Participation is possible for employees who perform tasks and responsibilities at the level of job scale 12 to 15. Managers are equipped in the very short term (a pressure cooker format of 3 x 2 days within a couple of months) for the responsibilities that are usually new to them, because they are often experts in other fields. Peer-to-peer coaching and, if desired, personal coaching form an integral part of this.

[31] https://www.maastrichtuniversity.nl/support/um-employees/you-and-your-work/personal-development/staff-career-centre/managers

[32] https://www.maastrichtuniversity.nl/support/um-employees/you-and-your-work/personal-development/staff-career-centre/managers

Appendix 2c

Report of the Midterm Review Committee 2015, Reaching out for another Summit

Jan Elen, Hans Gruber, Richard Reznick
October 2015

I. General section on procedures followed

The midterm review was initiated by the School of Health Professions Education (SHE) in view of the formal research assessment planned for 2018.

Since 2014, SHE has been a formally sanctioned graduate school in the Faculty of Health, Medicine and Life Sciences at Maastricht University. The Faculty has merged with the Academic Hospital into the Maastricht University Medical Center (UMC+).

The management team selected the reviewer committee which consisted of Jan Elen, KU Leuven, Belgium, Richard Reznick, Queen's University, Canada, and Hans Gruber, Universität Regensburg, Germany. The framework used for the midterm review report was the Standard Evaluation Protocol 2015-2021 (SEP) used for research assessments in the Netherlands. The review committee received and analyzed a self-assessment provided by SHE in September 2015. As stipulated in the guidelines of the SEP, the assessment report focused on the research in education activities of the school, the PhD program and the unit's valorization activities. The Assessment Committee conducted an on-site review on October 19, 2015 (see site visit program in the appendices).

II. Assessment of the research unit

a. Description of the research unit's strategy and targets

The School of Health Professions Education (SHE) and its research program *Research in Education* (RiE) have a mandate to provide 'research-based models and guidelines for improvement of health professions education'. This mandate is clearly stipulated in the self-report and was affirmed during the site visit. Although the primary focus is on application-oriented educational research, the research is based on strong and solid theories that contribute to its development. The RiE program concentrates on two main and broadly described research themes: 'Learning and Innovative Learning Environments' and 'Assessment and Evaluation'. A fundamental element of the RiE is a robust PhD program consisting of two streams, a 'regular stream' consisting of, for the most part, domestic students, and an international stream with students from around the world.

Based on a SWOT-analysis presented in the self-report, SHE identifies seven goals as major components of a future strategy. These include: (1) further expansion of international research collaborations; (2) further strengthening of its position and visibility in the national field of educational sciences; (3) the elaboration of stronger connections with 'paramedical' professions and relevant institutes for vocational and higher professional education; (4) the search for new funding possibilities in programs that focus on health rather than on education; (5) increasing the number of open access publications and more ample use of social media; (6) rendering SHE more attractive for young research talents also from developing countries, and (7) more attention for the internationalization of staff, recruitment of young talent and succession planning.

b. Qualitative and quantitative assessment

a. Research quality

It is the reviewers' observation that SHE has been very successful both in quantitative and qualitative terms. The committee concluded that SHE has well-deserved international reputation for its work in health professions education, and indeed, is regarded as one of the top centers in the world in its field. This was confirmed through benchmarking analyses with other well-regarded international units, through bibliometric analyses and through the array of national and international awards received by members of SHE.

The reviewers concluded that high quality research is being conducted in both of the research streams: 'Learning and Innovative Learning Environments' and 'Assessment and Evaluation'. The themes are general and inclusive which has resulted in a wide variety of studies both with respect to substance and with respect to methodology. The research strategy has been a deliberate and fruitful policy, which has allowed staff members to explore interesting topics through appropriate and diverse methodological approaches. Focusing on health professions education, SHE succeeds in establishing an impressive balance between studies that are educational in nature and studies that are more specifically directly oriented towards medical education. That balance is also seen in the journals in which the studies are

published. SHE members have succeeded in publishing in high level educational journals, in journals that focus specifically on medical education and as well, general medical journals which attract a wide readership across medical disciplines.

In line with the Standard Evaluation Protocol 2015-2021 which prescribes a scale of 1-4, the committee assigns a score of '1: World leading/excellent'.

b. Relevance to society

Relevance to society can be shown in very different ways. An important way in which SHE contributes to developments in society is by engaging in research that is meaningful to an improved understanding of educational theory that also translates to guiding improved educational practices. These improved educational practices ultimately lead to better quality outcomes in the training and education of future health care professionals. In the same vein, the PhD program (both the regular and international streams) contributes to society through the development of highly qualified personnel with a broad array of sophisticated research competencies related to educational improvement. The unit also contributes to society through its products, which include multiple course offerings of both a long and a short nature. These courses are organized by SHE staff members and delivered in the Netherlands as well as worldwide.

In addition to research and courses, SHE also has societal relevance through the development of specific instruments and approaches that are immediately useful for practice. All of these instruments and approaches are either a direct result of the research performed by SHE or have been inspired by its research findings. This has included the development of concrete products and procedures. The valorization activities associated with these products and procedures are highly esteemed and have proved to be marketable to both organizations and individuals. This, in turn, has generated a revenue stream that has further fueled SHE's research initiatives.

In line with the Standard Evaluation Protocol 2015-2021 which prescribes a scale of 1-4, the committee assigns a score of '1: World leading/excellent'.

c. Viability

In the Faculty a matrix structure for its governance has been elaborated with graduate schools and the educational institute on one dimension and the departments on the other dimension. While staff members belong to a 'department', they get their work from the schools (and/or the educational institute). For those unfamiliar with the structure, it is a bit difficult to understand, but in the case of SHE it seems to work very well. The structure allows for assigning the right tasks to the right persons. It allows for negotiation and stability.

The reviewers heard on multiple occasions, from multiple stakeholders, that the matrix structure is functioning very well, and that it facilitates the interactions within the organization. The reviewers were

so of the opinion that the unit benefited from strong leadership at three levels; the School, the RiE ogram and the PhD program. It is clear that both the structure and the strong leadership contribute to obust organization and an engaging and productive work climate. This view was fortified by nsistent and multiple expressions of high staff and student satisfaction at all levels: the faculty, the gular PhD students, and the international students.

IE and RiE seem to be financially sound, and have been able to attract and retain talented staff. They ve established interesting collaborations with other schools in the faculty, with the hospital and with her research centers, both nationally and internationally. While succession is regarded to be a tential issue, there is a strong talent-pool among existing staff and given SHE's strong international putation, external recruitment would also be a viable option.

line with the Standard Evaluation Protocol 2015-2021 which prescribes a scale of 1-4, the committee signs a score of '1: World leading/excellent'.

c. Quality and organization

a. PhD program

e PhD program is well organized and students can actively participate in its governance. As indicated e PhD program has a regular stream and an international stream. For both streams there are clear uctures that enrich the educational environment and ensure progression. These include: a PhD iting course as the starting point, coaching by supervisors and promotors, formal discussion of going PhD research through Web-streamed sessions called 'SHE Presents', thrice yearly journal clubs, biannual four-day building conference known as the 'SHE Academy', and an annual 'SHE Mini-ademy' in conjunction with the AMEE conference.

e reviewers observed that PhD candidates believe they are being held to the highest research ndards, but commented on the positive learning environment, which includes ample task-based edback and extensive opportunities to learn.

general terms the organization for the two PhD streams is similar. Both streams have in common, a undational PhD-writing course as a starting point. However, there are also marked differences. The gular PhD' candidates are employees of SHE and for the most part, reside in Maastricht. In contrast, e international stream students are a very heterogeneous group, many of whom are practicing health re professionals, and many who are engaged in the PhD on a part-time basis. That distinction deserves be recognized. The 'regular PhD' students often work in the context of a project elaborated by one of e staff members. They are also encouraged to attend courses from national research schools. The mber of total hours of formal course-work for the 'regular' PhD students is significant. In contrast, the ternational stream students often combine their research work with a job in one of the health ofessions, work on a project that has been self-initiated and have less immediate access to courses d professionalization initiatives. As mentioned, the international cohort is very heterogeneous, but mple efforts are made to accommodate their diverse needs. That being said, the reviewers were ovided evidence that indicated higher success rates and fewer years to completion for the 'regular eam' students compared to the international stream.

Of importance, the program has made explicit attempts to bring students together, through the aforementioned programs (SHE Academy, SHE Presents) so that they can learn from one another and as well as from staff members and researchers from around the globe. Recently new interesting initiatives have been taken (e.g., blended learning programs) or are planned (e.g., scholarships) to provide even more educational opportunities.

b. Research integrity policy

With respect to research integrity SHE adopts and enacts the established principles of the Faculty of Health, Medicine and Life Sciences, and of Maastricht University. The reviewers found these research policies and procedures to be grounded in sound principles, and that these principles seem to be well established. SHE pays ample attention to research integrity in its own research and in that of its PhD students. It also draws attention to research integrity during workshops and supervisor meetings.

III. Recommendations

In its self-report, SHE elaborates seven strategies/actions that they believe will further strengthen what is an already high-performing organization. The committee encourages SHE to engage in each of the specified actions. They will help to make what is an excellent organization even better and serve to stimulate ongoing innovation. It is the reviewers' observation that the successes of SHE have been an affirmation of the unusual and strategic choice made by the faculty of establishing a graduate school devoted to health professional education.

As part of the seven strategies outlined in the self-report and in total alignment with the options taken and considering the different elements of the assessment protocol, the committee suggests the following:

- With respect to research policy, SHE and RiE should consider further specifying, within the two general research themes, areas of specific research in which SHE wants to have global impact.
- SHE and RiE should consider an accelerated program of fundraising, including general philanthropic efforts and those directed to specific initiatives.
- SHE and RiE should consider initiatives that would promote an international character for the staff and as such, include hiring international students for the 'regular PhD' track.
- With respect to international PhD students, the PhD program should consider interventions to encourage them to augment the protected time they have available for their PhD work (e.g., imposing of deadlines, dissertation to be submitted within six years).
- With respect to collaboration, consideration should be given to developing more structural links with entities in the hospital. For example, the reviewers learned that there are multiple simulation laboratories in Maastricht, and integration of efforts between the hospital and SHE and the faculty may yield beneficial synergies.
- With respect to societal relevance, SHE and RiE should consider to tracking the careers of their graduates.
- SHE and RiE should consider accelerating their use of social media communication vehicles.
- In consideration of the fact that PhD candidates who are health professionals, are for the most part, from the discipline of medicine, SHE and RiE should consider strategies to augment its reach to include other health professional disciplines.

Finally, the committee would like to strongly recommend that in addition to the more operational, incremental strategies and actions put forward, SHE engage in an initiative, such as a formal strategic planning process, to specify more transformative goals and to develop a plan to reach those goals. The elaboration of a transformative mission with clear and challenging strategic goals is a difficult endeavor for which external support might be useful.

It is the review committee's opinion that the extremely strong foundation on which SHE and RiE sits, enables them, at this time, to be thinking of bold and transformative next steps. SHE and RiE are already in a position of global leadership, and are at an inflection point that will allow them to reach out for the next summit.

IV. Compulsory appendices

a. CVs

Jan Elen, Licentiate Educational Sciences (KU Leuven), Teacher Certificate Higher Secondary Education Behavioral Sciences (KU Leuven), Doctor in Educational Sciences (KU Leuven)

Working experience

2001-2006	Professor KU Leuven
2006-…	Full Professor KU Leuven

Managerial positions

1999-2004	Academic Responsible, Educational Support Office, KU Leuven
2003-2007	Coordinator EARLI SIG Instructional Design
2006-2010	Coordinator School of Education Association KU Leuven
2010-2015	Vicedean Education Faculty of Psychology and Educational Sciences, KU Leuven
2014-…	Academic responsible behavioral sciences teacher education program
2014-…	Director of the Master Educational Studies program

Overview current teaching assignments

- Learning and Teaching (Teacher Education KU Leuven)
- Orientation to Practice (Teacher Education, KU Leuven)
- Pedagogy of Teacher Education (Educational Sciences, KU Leuven)
- Instructional Psychology and Technology (Educational Sciences, KU Leuven)
- Topics in Educational Technology (Educational Sciences, KU Leuven, Leuven and Kortrijk)
- Designing Learning Environments (Educational Sciences, KU Leuven)
- Coaching of internships of students in teacher education
- Annually: coaching of about 7 master students for their masters' thesis

Overview of research activities

(co-)Supervisor of ten on-going dissertations projects

(co-)Supervisor of 12 successfully defended dissertations

- Juarez Collazo, Norma Araceli
  Unravelling tool usage. Analyzing the functionality of tools and the variables influencing the use of tools in computer-based learning environments
- Lust, Griet
  Opening the Black Box. Students' Tool-use within a Technology-Enhanced learning environment: An Ecological-Valid Approach
- Corradi, David
  Understanding and Optimizing the Use of Multiple External Representations in Chemistry Education
- Callens, Jean Claude
  Impact van reflectie-aanpak en learner control op kritisch reflecteren
- Briell, Jeremy
  The conceptualization, measurement, and educational relevence of personal epistemology
- Jiang, Lai
  Instructional Effectiveness of Scaffolds: Roles of Learner Variables
- Verburgh, An
  Research integration in higher education: prevalence and relationship with critical thinking
- Wu, Xiaoli
  Vocabulary learning from reading: Examining the interactions between task and learner related variables
- Sarfo, Frederick Kwaku
  Developing technical expertise in secondary technical schools in Ghana: The effect of powerful learning environments with and without ICT and the moderating effect of instructional conceptions.
- Clarebout, Geraldine
  The enhancement of optimal tool use in open learning environments.
- Iserbyt, Peter
  Reciprocal Peer Tutoring with task cards: Fostering learning outcomes inpsychomotor tasks
- Aly, Medhat
  'Towards a macro-sequencing model for instructional multi-mediaprograms in postgraduate orthodontic training'

Coaching of scientific assistants in multiple projects **:**

GOA GOA/12/010: Analysing and stimulating number sense (co-promotor)

FWO G-08-00256: Representational adaptivity in mathematical thinking and learning: analysis and improvement (co-promotor)

Current Editorial Work

Senior Editor: Instructional Science

Assistant Editor: Educational Research International

Reviewer of multiple international journals

Dr. Richard K. Reznick, MD, MEd, FRCSC, FACS, FRCS Ed (hon), FRCSI (hon)
Dean, Faculty of Health Sciences, Queen's University
Chief Executive Officer, Southeastern Ontario Academic Medical Association

Richard Reznick is married to Cheryl, and they have three children Joanna, Josh and Gabriel. Born in Montreal, he received his undergraduate university education and medical degree from McGillUniversity, followed by a general surgical residency at the University of Toronto. He spent two years in fellowship training, first obtaining a Masters' degree in medical education from Southern Illinois University, follow by a fellowship in colorectal surgery at the University of Texas in Houston, Texas.

Since his first faculty appointment at the University of Toronto in 1987, Dr. Reznick has been active in both colorectal surgery and research in medical education. He was instrumental in developing a performance-based examination, which is now used for medical licensure in Canada. He ran a research program on assessment of technical competence for surgeons and supervised a fellowship program in surgical education.

At the University of Toronto Faculty of Medicine, he was the inaugural Director of the Faculty's Centre forResearch in Education at University Health Network (The Wilson Centre)from 1997 to 2002. In 1999 he was appointed Vice President of Education at University Health Network. He served eight years as the R. S. McLaughlin Professor and Chairman of the Department of Surgery at the University of Toronto from 2002-2010.

In July 2010, Dr. Reznick assumed the position of Dean, Faculty of Health Sciences at Queen's University and Chief Executive Officer of the Southeastern Ontario Academic Medical Organization (SEAMO).

Dr. Reznick has received numerous awards for his work in education, including the Royal College of Physicians and Surgeons of Canada Medal in Surgery, the Association for Surgical Education Distinguished Educator Award, the National Board of Medical Examiners John P. Hubbard Award, the Daniel C. Tosteson Award for Leadership in Medical Education, the 2006 Inaugural University of Toronto President's Teaching Award and the Karolinska Institutet Prize for Research in Medical Education. In July of 2011 Dr. Reznick was awarded an honourary fellowship from the Royal College of Surgeons of Scotland, and in November of 2011, an honourary fellowship from the Royal College of Surgeons in Ireland.

Dr. Reznick is the author of over 120 peer-reviewed publications and has given over 200 lectures to hospitals, universities and scientific organizations around the world.

Dr. Dr. h. c. Hans Gruber (born August 24, 1960)

Full Professor of Educational Science at the University of Regensburg, Germany

Visiting Professor at the Faculty of Education, University of Turku, Finland

hans.gruber@ur.de

- Study of psychology at the University of Munich (Germany)
- Post-graduate scholarship at the Max-Planck-Institute for Psychological Research, Section Developmental Psychology (group of Professor Weinert)
- Doctoral dissertation 1990, Ph.D. training in Psychology, Education, and German Literature
- Assistant professor for Educational Psychology at the University of Munich (group of Professor Mandl)
- Habilitation (psychology and educational science) 1998, University of Munich
- Honorary Doctorate 2015, Faculty of Education, University of Turku, Finland
- Since 1998 full professor for Educational Science at the University of Regensburg
- Since 2013 Senior Fellow of the Faculty of Education, University of Turku, Finland
- Since 2015 Visiting Professor at the Faculty of Education, University of Turku, Finland

- Main research topics: Professional learning, Expertise, Workplace Learning, Social Network Analysis, Higher Education
- President of the European Association for Research on Learning and Instruction (EARLI)
- Member of the Review Board "Educational Science" of the German Research Foundation (Deutsche Forschungsgemeinschaft) - reelected
- Member of the Accreditation Commission of ACQUIN (Accreditation, Certification and Quality Assurance Institute)
- Member of the Programme Commission of the VHB (Virtuelle Hochschule Bayern; Virtual University of Bavaria)
- Reviewer for about 35 international journals and about 30 international research organisations
- Reviewer for 25 different universities in professorship appointments
- More than 50 different positions within academic self-administration (e.g. Vice-Rector, Dean, Director of the Centre for Higher Education)
- Awards: Teaching Award of Bavarian State Universities (2000), E-Learning in Medicine / Medikinale (2000), Research Award of the University of Regensburg (2006), Research Award of the Feldenkrais and Somatic Learning Society (2006), Best Paper Award JURE (2008)
- Board memberships: High Ability Studies, Vocations and Learning. Studies in Vocational and Professional Education, Zeitschrift für Pädagogische Psychologie, Centre for Learning Research at the University of Turku (Finland), Talent Development and Excellence, Book series Professional and Practice-Based Learning (Springer Verlag), Book series Innovation and Change in Professional Education (Springer Verlag), Educational Research Review
- Funding: 11x Deutsche Forschungsgemeinschaft (DFG) (average per project: 200.000 €), several times ministerial funding
- Completed supervisions: 11x „Habilitation" (6 achieved full professorship meanwhile), 19 doctoral dissertations (first supervisor), 41 doctoral dissertations (second supervisor), more than 300 diploma/master theses
- 2000-2008 Director of the Centre for Higher Education at the University of Regensburg
- 2004-2010 Liaison Officer of the German Research Foundation (Deutsche Forschungsgemeinschaft) at the University of Regensburg
- 2010-2012 Vice-Rector for Study Affairs of the University of Regensburg, Germany

- Founding chair of the Special Interest Group “Learning and Professional Development” of the EARLI (jointly with Professor Boshuizen)
- Visiting professorships at the University of Turku, Finland (2007), the Paris Lodron University at Salzburg, Austria (2012), and the University of Turku, Finland (2013)

b. Site visit programme

Sunday, October 18, 2015

19.00 Dinner with the Scientific Director of SHE (Cees van der Vleuten) and the Management Team of Research in Education (Jeroen van Merrienboer, Diana Dolmans, Anique de Bruin, Lorette Stammen).

Monday, October 19, 2015 (DocProf room, UNS 60 - N4.22)

8.45-9.00	Welcome and introduction to the SHE by the Research Director (Jeroen van Merrienboer) and secretary (Lilian Swaen)
9.00-10.00	Closed meeting of the audit committee, discuss self-assessment report, study available documentation in the room, and prepare questions for meetings.
10.00-11.00	Discussion with Management Team of Research in Education (Jeroen van Merrienboer, Diana Dolmans, Anique de Bruin, Jorrick Beckers)
11.00-12.00	Discussion with Staff Members of Research in Education
12.00-13.00	*Lunch*
13.00-14.00	Discussion on PhD coordination and PhD activities (Anique de Bruin, Diana Dolmans, Lilian Swaen)
14.00-15.00	Discussion with PhD candidates
15.00-15.30	Possibility to discuss final issues and remaining questions with Management Team of Research in Education
15.30-16.30	Preparation of first oral impression by review committee
16.30-17.00	Public presentation of first impressions
17.00	Informal end / drinks

c. Quantitative data on the research unit's composition and financing

Taken from the self-report

Table 1. Research staff at School level - RiE (FTE / year).

	2010		2011		2012		2013		2014		2015	
	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
RiE												
Scientific staff[1]	31	8,4	32	8,6	29	7,7	26	6,9	27	7,1	27	7,9
Post-docs[2]	0	0,0	0	0,0	0	0,0	0	0,0	2	1,1	3	2,0
PhD students (UM-appointed)[3]	21	12,1	30	12,5	17	11,0	14	8,3	9	6,3	8	6,2
PhD students (international)[4]	43	0,0	52	0,0	49	0,0	56	0,0	60	0,0	56	0,0
Total research staff[5]	**52**	**20,6**	**62**	**21,1**	**46**	**18,8**	**40**	**15,2**	**38**	**14,5**	**38**	**16,1**
Support staff	14	5,7	15	4,2	9	4,9	9	3,9	9	2,9	8	3,6
Visiting fellows	3	0,1	6	0,1	3	0,1	2	0,0	0	0,0	0	0,0
Total staff	**69**	**26,3**	**83**	**25,4**	**58**	**23,7**	**51**	**19,1**	**47**	**17,4**	**46**	**19,7**

[1]Comparable with WOPI-categories *HGL, UHD* and *UD*, tenured and non-tenured staff.
[2]Comparable with WOPI-category *onderzoeker*, including postdocs.
[3]Regular PhDs (employed by Maastricht University).
[4]International/external PhDs (not employed by Maastricht University).
[5]International/external PhDs excluded.

Table 2. Funding of RiE.

	2010		2011		2012		2013		2014		2015	
	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Funding:												
Direct funding[1]	23,0	87,2	20,5	80,8	17,3	73,2	13,9	73,3	12,8	74,4	13,8	76,6
Research grants[2]	1,9	7,2	1,8	7,0	2,3	9,6	2,4	12,6	2,2	12,9	2,1	11,7
Contract research[3]	1,4	5,3	2,7	10,6	3,6	15,2	2,2	11,5	1,7	9,9	1,5	8,5
Other	0,1	0,3	0,4	1,6	0,5	2,0	0,5	2,5	0,5	2,8	0,6	3,4
Total funding	**26,3**	**100**	**25,4**	**100**	**23,6**	**100**	**18,9**	**100**	**17,2**	**100**	**18,0**	**100**
Expenditure (Keuro):												
Personnel costs	1.388,7	83,3	1.320,0	86,6	1.284,9	84,6	1.264,6	86,3	1.312,3	87,4	1.445,1	87,1
Other costs	278,7	16,7	204,7	13,4	233,6	15,4	201,3	13,7	189,3	12,6	213,3	12,9
Total expenditure	**1.667,4**	**100**	**1.524,7**	**100**	**1.518,5**	**100**	**1.465,8**	**100**	**1.501,6**	**100**	**1.658,4**	**100**

[1]Direct funding by Maastricht University / FHML.
[2]Research grants obtained in national and international competitions (e.g., grants from NWO, ZonMw and ERC – see Appendix 6.2).
[3]Research contracts for specific research projects obtained from external organizations, such as industry, governmental ministries, European Commission, and charity organizations.

Appendix 2d

Assessment report of the 2012-2017 review

SHE Self-Assessment Report 2012-2017

The School of Health Professions Education (SHE) was founded in 2005 but it was not until 2014 that it gained full recognition as one of the six official graduate schools in the Faculty of Health, Medicine and Life Sciences (FHML) of Maastricht University and in the Maastricht University Medical Center+ (Maastricht UMC+), which is a close collaboration between the FHML and the Academic Hospital of Maastricht. Although the SHE was founded only 13 years ago, many of its activities have a much longer history. Its educational Master's program, the *Master of Health Professions Education* (MHPE), already started in 1992 and is accredited by the Accreditation Organization of the Netherlands and Flanders who hallmarked "internationalization" as its distinctive quality feature. Its research program *Research in Education* (RiE) has an even longer history that goes back to the founding of Maastricht University in the mid-1970s, but it only started to grow substantially with the establishment of an *International PhD Program* in the 2000s.

Because the SHE activities were expanding rapidly and becoming more and more intertwined, an informal review committee (consisting of Prof. Henk Schmidt and Prof. John Norcini) visited the SHE in 2011. The SHE did not participate in the national Pedagogics and Education Science Research Review of 2013 because at that time it was not yet recognized as an official school in the FHML and the assessment followed too shortly after the informal review of 2011. However, a Midterm Review committee (chaired by Prof. Jan Elen and assisted by Prof. Hans Gruber and Prof. Richard Reznick) visited the school in 2015 and assessed its research program according to the Standard Evaluation Protocol 2015-2021 (see the report of the Midterm Review Committee, *Reaching out for another Summit*, in Appendix 2A). The next chapter presents the objectives and research area of the SHE, mainly looking back on the developments that took place in the period 2012-2017, and also discusses the actions that have been undertaken since the 2015 Midterm Review.

1. Objectives and Research Area

1.1. Vision, Mission, and Objectives

The SHE is a graduate school for research, education, and innovation in health professions education (see https://she.mumc.maastrichtuniversity.nl). The *vision* of the SHE is that of a world in which all healthcare professionals, such as medical doctors, nurses, physical therapists, dentists, care technicians, et cetera, are very well educated and in the best position to contribute to the quality of care. The *mission* is to realize this vision by (a) doing high-quality multidisciplinary research on how to best educate health professionals, (b) teaching health professionals how to conduct such research and how to make proper use of the findings from this research (e.g., evidence-informed design guidelines, models, software tools, etc.), and (c) applying the findings of this research in valorization activities. *Objectives* thus relate to research, education, and valorization and are interwoven into what we call the SHE's *double-chain approach* (see Figure 1).

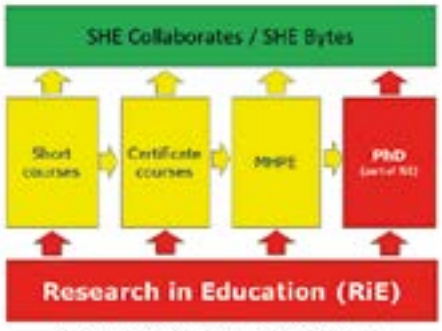

Figure 1. The double-chain approach of the SHE.

The first "valorization chain" goes from the bottom to the top, starting with application-oriented educational research which is essential for finding new and better ways to educate health professionals. The findings of this research consequently feed into the educational activities of the SHE. The chain is completed when the research findings and related educational activities feed into valorization activities. The second "educational chain" goes from left to right, starting with short courses for participants who want to become familiar with health professions education. Next in the chain are certificate courses for participants who want to learn more about particular topics in health professions education, followed by

the research-based MHPE program for participants who want to become academic educators of health professionals. Ending the chain is a PhD program for participants who want to become researchers in health professions education. It is not uncommon for students to first take a short course and end up doing research in the PhD program. This self-assessment report will mainly focus on RiE which is the basis of all the activities conducted in the SHE and which includes the PhD program.

1.2. Strategy and Research Area

The general aim of RiE is to provide research-based models, guidelines, and tools for improvement of health professions education. In order to reach this goal, researchers conduct high-quality application-oriented research, which is typically multidisciplinary in nature and both inspired by and contributing to educational theory. The focus is on problems that have both theoretical and practical relevance. In terms of research methods, the program uses all methods that may help to answer relevant research questions, ranging from descriptive-qualitative studies and experimental-quantitative studies, through narrative reviews and statistical meta-analyses, to short intervention studies and longitudinal design-based research projects. Yet, where possible, if at all, methods are combined (mixed methods, triangulation) to strengthen the reliability and validity of research findings.

Until 2015, the research program of the SHE was only briefly described in two themes, "learning and innovative training environments" and "assessment and evaluation." One advice of the Midterm Review Committee was to develop a more elaborate description of the research program. As a result, we renamed the program *Task-Centered Learning Environments in the Health Professions,* revising its purview to span four interrelated themes (see Appendix 2B):

1. *Goals, values, and approaches to evaluation*. Health professions education aims to train healthcare professionals to contribute to excellent care within the dynamic context of healthcare. This requires an understanding of which competences can best be trained, how education can contribute to improving the quality of care, and how health professions education can best be evaluated.
2. *Approaches to instruction*. In education, there are no instructional approaches that always work: particular methods support particular goals under particular conditions. Healthcare education in particular covers a great diversity of contexts, from classroom settings within medical schools through public health information sessions provided in the community, to tertiary care hospitals and solo practices in remote areas.
3. *Approaches to assessment*. Research findings consistently indicate that assessment design and assessment practices always and inevitably need compromising and that any single assessment is bound to be flawed. High-quality assessment therefore involves a combination of carefully selected assessment methods in a program of assessment that is fit for purpose and optimally aligned with intended learning outcomes and approaches to instruction.
4. *Approaches to Implementation.* The effects of approaches to evaluation, instruction, and assessment are always mediated by perceptions and expectations of students, teachers, and other stakeholders. Furthermore, each local context will differ to some extent from the context in which the approach was developed and/or in which prior research was conducted, which poses many challenges to successful implementation.

1.3. Specific Targets of the Past Six Years

Ambitions of RiE relate to the number of completed PhD theses, external research funding, and scientific output. The target for 2012-2017 was to achieve at least 10 completed PhD projects per year, whereas our mean output was 9.3 completed PhD projects per year. The target for external research funding was set at 750,000 euro per year, which we reached because we secured funding for some large research projects. In 2016, this target was raised to 1 million euro per year. The target for scientific peer-reviewed publications (in both JCR and non-JCR journals) was set at 120 per year; this target was met with 128 publications per year over the six-year period but with annual fluctuations. Qualitative aims for research and valorization are considered at least as important and will be discussed in sections 3.3 and 4.3.

In response to the comments and suggestions of the Midterm Review Committee which found RiE to be "world leading/excellent" based on all three evaluation criteria and praised the very strong international reputation of the SHE, an action list was prepared and discussed with the research staff and with the FHML Faculty Board (see Appendix 2C). The action list contained the following 9 items:

1. *With respect to research policy, RiE should consider further specifying areas of research in which SHE wants to have a global impact*. As mentioned previously, this led us to reformulate our research program (for a full description, please refer to Appendix 2B).
2. *RiE should consider an accelerated program of fundraising, including general philanthropic efforts and those directed toward specific initiatives.* It was decided to link such a fundraising program to the SHE Scholarship program, which offers students from developing countries opportunities to do research in the SHE. The scholarship program was implemented in 2016.
3. *RiE should consider initiatives that would promote an international character in terms of staff and therefore include hiring international students for the "regular PhD" track.* With some success, actions were taken to hire more international staff and regular PhD students. This will be further described in section 2.2 and Chapter 7 on Diversity.
4. *With respect to international PhD students, the PhD program should consider interventions to encourage them to augment the protected time they have available for their PhD work.* Actions that have been taken to help international PhD students stay on schedule will be discussed in section 5.2.
5. *With respect to collaboration, consideration should be given to the development of more structural links with entities in the hospital.* A full-time postdoc was hired to set up research in collaboration with the Maastricht UMC+ Academy which is responsible for the medical residency programs of all clinical departments, continuous education of nurses and other healthcare providers, and which also houses a well-equipped simulation laboratory. Since 2017, the SHE and the Maastricht UMC+ Academy have jointly organized an annual research day on educational research in clinical practice.
6. *With respect to societal relevance, SHE and RiE should consider tracking the careers of their graduates*. In collaboration with SHEILA, the alumni organization of the SHE, more information on graduates from the PhD program is now gathered on a regular basis and communication with alumni has been strengthened. Results will be presented in sections 5.1 and 5.3.
7. *SHE and RiE should consider accelerating their use of social media communication vehicles*. In addition to the monthly newsletter (SHE Communicates), the SHE now also uses a Twitter and a Facebook account to communicate information and news.
8. *International PhD candidates mainly have a background in medicine; SHE should consider strategies to augment its reach to include other health professional disciplines*. Collaborations with educational institutes that offer programs in the health professions (both universities of applied sciences and institutes for senior vocational education, e.g., Zuyd University of applied sciences, Rijnland College) have been strengthened and new projects with the nursing training programs offered by the Maastricht UMC+ Academy are in preparation.
9. *Finally, the committee would like to strongly recommend that the SHE engages in a formal strategic planning process, specifies more transformative goals, and develops a plan to reach those goals*. A process of strategy development was started in 2017, supported by a consultancy firm (TopChange) and guided by Prof. Karl Dittrich and Prof. Wil Foppen. The executive summary of the final report can be found in Appendix 2D and the preliminary plans are also briefly described in section 8.3.

2. SHE's Organization, Composition, and Financing

2.1. Organization and Embedding of the School

Prof. Cees van der Vleuten and Prof. Jeroen van Merriënboer form the management of the SHE. In his capacity of Scientific Director, Prof. Cees van der Vleuten is responsible for the overall management and scientific quality of the work conducted within the school. He is Chair of the SHE management team and main representative of the school for external contacts. Prof. Jeroen van Merriënboer, in his capacity of

Research Director, is responsible for the SHE Research and PhD program (RiE). He is Vice-Chair of the management team and sits on the FHML Board of Directors as the school's main representative. The Management Team of SHE is further composed of an educational director (SHE Educates: Dr. Ineke Wolfhagen), a director of international consultancy (SHE Collaborates: Dr. Geraldine Beaujean), and support staff (managing director since 2018: Dominique Waterval; financial controller: Raymond Bastin; public relations officer: Danielle Vogt; secretary: Lilian Swaen). RiE has its own management team that meets at least once per month: Prof. Jeroen van Merriënboer, Chair; Prof. Diana Dolmans, Vice-Chair and scientific staff representative; Dr. Anique de Bruin, PhD Coordinator; Jolien Pieters, MSc, PhD candidates' representative, and Nicky Verleng, secretary.

Since 2014, the SHE has officially been among the six schools in the FHML. Before that time, it was part of the Educational Institute which is mainly responsible for the organization of the educational programs. The FHML is the largest faculty of Maastricht University, accounting for 65% of the university's total staff and budget. It was established in 2007 after a merger of the former faculties of Health Sciences and Medicine. The FHML has a matrix structure, with "departments" on one side and "schools" and the "educational institute" on the other side of the matrix. The FHML and the Academic Hospital of Maastricht work closely together in the Maastricht UMC+ which is a center for integrated healthcare, research, and education that covers the entire spectrum of the health sciences, medicine, and molecular life sciences. The "+" added to the name is an expression of its additional focus on health instead of just medicine, cure, or care. A more elaborate description of the FHML, the Maastricht UMC+, and Maastricht University can be found in Appendix 2E.

2.2. Composition

Since the FHML has a matrix structure, researchers in the SHE come from different departments. The majority is from the Department of Educational Development and Research and the Skills Laboratory, but there are also researchers from other departments such as Methodology and Statistics, Pathology, Anatomy, and Radiology (see Appendix 1B for an overview of staff members). As from 2016, the policy in terms of research labeling is to allocate a maximum of 0.5 FTE to all tenured research staff for direct government-funded research. In addition to regular research staff, the SHE has three special categories of researchers: (1) educational professors, (2) affiliated professors, and (3) professors/researchers with a registration. Staff members from all three special categories serve on PhD supervisory committees. *Educational professors* advance their careers in the FHML by developing and innovating education in their own scientific discipline; they have been allocated 0.2 FTE for doing research in the SHE on the educational effects of those innovation projects (financed by the Educational Institute). *Affiliated professors* have a position in the Academic Hospital of Maastricht or affiliated hospitals, such as the Atrium hospital in Heerlen and the Catharina hospital in Eindhoven; they have been allocated 0.2 FTE for doing research in the SHE on training in clinical practice (half of which is typically financed by their own hospital and the other half by the FHML). Finally, researchers with a registration (cf. 0-appointments or honorary positions) have a position in research groups that collaborate closely with the SHE. All SHE research staff regularly meet in "staff meetings" which are organized four times per year. In these meetings, all research policies, new developments, and practical issues regarding research and the PhD program are discussed. In addition, all professors and associated professors meet two times a year to discuss issues related to research policies. Because affiliated professors are not available during the day due to their clinical duties, these biannual meetings take place in the evening.

Table 1 (Appendix 1A) shows how many research FTEs were invested in the period spanning 2012 to 2017. Overall, we see a substantial increase of research staff. As for scientific staff, we see an increase from 7.9 FTE in 2012 to 11.1 FTE in 2017. Especially in the last two years, scientific capacity has expanded because of acquired project funding as well as an increase in direct funding. As for postdocs and full-time PhD students, we see a sharp increase in both postdocs (from 0 in 2012 to 7 in 2017) and full-time PhD students (from 12 in 2012 to 23 in 2017). This is mainly due to increased external research funding, especially the acquisition of some large projects in 2015/2016. In addition, four full-time PhDs were hired

to do research on educational innovations in the FHML. Finally, the number of part-time PhD students has also grown (from 52 in 2012 to 75 in 2017), which is mainly due to an increased intake of participants for the PhD Research Proposal Writing Course that is nowadays offered twice a year (this will be further discussed in section 5.1).

Table 1 (Appendix 1A). SHE-RiE research staff (FTE / year)

	2012		2013		2014		2015		2016		2017	
SHE-RiE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE	#	FTE
Scientific staff	31	7.9	31	7.8	31	7.6	32	7.9	43	9.1	47	11.1
Post-docs	0	0.0	1	0.6	1	1.0	2	1.2	5	3.8	7	4.2
PhD students (full-time)[a]	12	9.3	13	7.6	12	7.5	14	10.4	17	12.1	23	17.5
PhD students (part-time)[b]	52	1.6	58	0.5	65	0,3	69	0.0	77	0.7	75	1.4
External PhD students	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total research staff	**95**	**18.8**	**103**	**16.4**	**109**	**16.4**	**117**	**19.5**	**142**	**25.8**	**152**	**34.3**
Support staff	9	4.9	9	3.9	9	2.9	12	3.6	17	3.9	43	4.7
Visiting fellows[c]	1	0.0	2	0.0	1	0.0	3	0.0	3	0.0	2	0.0
Total staff	**105**	**23.6**	**114**	**20.3**	**119**	**19.4**	**132**	**23.0**	**162**	**29.7**	**197**	**39.0**
Scientific staff (FHML)	29	7.9	27	7.6	27	7.4	28	7.7	38	8.9	43	11.0
Scientific staff (Academic Hospital Maastricht)	1	0.1	1	0.2	1	0.2	1	0.2	1	0.2	1	0.1
Scientific staff (affiliated)	1	0.0	3	0.0	3	0.0	3	0.0	4	0.0	3	0.0
Total scientific staff	**31**	**7.9**	**31**	**7.8**	**31**	**7.6**	**32**	**7.9**	**43**	**9.1**	**47**	**11.1**
Support staff (research)	5	3.4	5	2.4	5	1.5	8	2.1	12	2.3	36	2.3
Support staff (managerial)	4	1.5	4	1.5	4	1.5	4	1.5	5	1.7	7	2.4
Total support staff	**9**	**4.9**	**9**	**3.9**	**9**	**2.9**	**12**	**3.6**	**17**	**3.9**	**43**	**4.7**

[a]Regular PhDs (full-time appointment at Maastricht University) *plus* full-time scholarship PhD students.

[b]Regular PhDs (part-time appointment at Maastricht University) *plus* employees following a part-time PhD trajectory *plus* PhDs in the international PhD program.

[c]Visiting fellows are listed in Appendix 2F.

2.3. Financing

Table 2 (Appendix 1C). Funding of RiE.

	2012		2013		2014		2015		2016		2017	
RiE	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%	FTE	%
Funding:												
Direct funding	17.4	73.5	14.1	69.4	13.0	67.0	16.5	71.5	20.1	67.8	25.8	66.2
National grants	2.5	10.7	2.4	11.7	1.8	9.4	1.5	6.3	2.9	9.8	3.6	9.2
International grants	0.0	0.0	0.0	0.0	0.4	2.1	1.0	4.2	1.8	5.9	2.8	7.2
Contract research	3.3	13.7	2.2	10.8	1.7	8.8	1.5	6.5	2.0	6.8	3.1	8.0
Other	0.5	2.0	1.6	8.1	2.5	12.8	2.6	11.5	2.9	9.7	3.7	9.4
Total funding	**23.6**	**100**	**20.3**	**100**	**19.4**	**100**	**23.0**	**100**	**29.7**	**100**	**39.0**	**100**
Expenditure in euro:												
Personnel costs	1,284.9	84.6	1,264.6	86.3	1,312.3	87.4	1,556.3	87.8	1.953.5	79.9	2,571.8	75.6
Other costs	233.6	15.4	201.3	13.7	189.3	12.6	216.8	12.2	490.4	20.1	830.3	24.4
Total expenditure	**1,518.5**	**100**	**1,465.8**	**100**	**1,501.6**	**100**	**1,773.1**	**100**	**2,443.9**	**100**	**3,402.2**	**100**

Table 2 (Appendix 1C) provides an overview of the internal and external sources of funding of RiE. The percentage of external funding has grown somewhat from 26.4% in 2012 to 33.8% in 2017. Conversely, the amount of direct funding decreased from 73.5% to 66.2%. Total funding, however, has grown exponentially from 23.6 FTE in 2012 to 39.0 FTE in 2017, while total expenditure more than doubled from 1.5 million to 3.4 million euro. RiE takes a number of actions to obtain research grants. First, one researcher (currently Dr. Anique de Bruin) keeps track of all interesting future research calls and proposal deadlines; following the Midterm Review, attention is also paid to non-regular funding organizations (e.g., Jacobs, Spencer). This

information, presented as a Funding Overview, is regularly discussed with all researchers in the RiE staff meetings. Second, special Grant Meetings are organized at least four times a year. In these meetings researchers discuss drafts of project proposals they are preparing and exchange experiences with each other. Moreover, they keep a shared database with funded as well as unfunded project proposals (on the so-called RiE Wiki). Third, both PhD candidates and staff members are encouraged to participate in courses and workshops organized by the SHE, Maastricht University, and external organizations on "how to obtain research funding." The FHML Grants Office also offers practical assistance with the preparation of proposals; Marco Berndes is the main contact person of the SHE and he also regularly participates in the SHE Grant Meetings. And lastly, researchers are stimulated to participate in ZonMw, NWO, and NRO committees (see Appendix 1D – Box 3 for an overview of grants obtained and an overview of memberships of scientific committees).

It should be mentioned that research funding is only part of the external revenues of the SHE. The school has been very effective in developing valorization activities. *SHE Collaborates* is a successful branch of the SHE that offers tailor-made courses, support, and consultancy on educational innovation across the world. *SHE Bytes* brings educational software to the market. These valorization activities greatly contribute to the turnover of the SHE, and the valorization revenues are partly rechanneled into research. This will be further described in section 4.2.

3. Research Quality

3.1. Demonstrable Research Products for Peers

Table 3 (Appendix 1D – Box 1) gives an overview of the research output. The great majority of the scientific output of the SHE is published in peer-reviewed journals. The aim was to publish at least 120 articles per year (both JCR and non-JCR) and, although this number did not materialize each year, we did accomplish an average of 128 publications over the 6-year period. In 2017, the number of publications peaked at 141 because of the growth in funding and personnel starting in 2016. The relative increase of publications in non-JCR journals is the result of the SHE's investment in the development of the new journal *Perspectives on Medical Education,* of which Prof. Erik Driessen is currently Editor-in-Chief. We expect this Springer journal will receive JCR status in the summer of 2018. Over the six-year period, the research output translates to 128/8.6 = 14.9 peer-reviewed journal articles per 1 scientific staff FTE per year (mean # of JCR and non-JCR articles = 128; mean # of scientific staff FTEs = 8.6). For an overview of all publications in refereed journals, books and book chapters, and published conference proceedings we refer to the website of the SHE. The lists on the website unveil that SHE researchers publish not only in health professions education journals, but also in highly ranked general education and educational psychology journals and, to a lesser degree, in clinical journals that have an interest in educational issues.

Table 3 (Appendix 1D – Box 1). Main categories of scientific output for SHE/RiE.

RiE	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Articles in JCR journals	113	121	95	88	90	105
Articles in non-JCR journals – refereed	24	17	21	24	34	36
Articles in non-JCR journals - non-refereed	-	-	-	-	-	-
Books	4	1	0	0	0	1
Book chapters	17	15	10	9	3	16
Published conference proceedings	17	6	18	23	21	6
PhD theses	11	8	11	8	9	9
Other *scientific* research output[a]	5	11	8	10	20	10
TOTAL	**191**	**179**	**163**	**162**	**177**	**183**

[a]Other *scientific* research output relates to cases, editorial materials (commentaries, replies), inaugural addresses, and translations of scientific articles and books; see Appendix 2G.

An important output category is the number of completed PhD theses. In the six-year period, the ambition was to attract at least 12 new PhD candidates per year, either regular PhDs who are appointed at Maastricht University or international PhDs with a student status, and to realize 10 graduations (i.e.,

factoring in a maximum dropout of 17%). As can be seen in Table 3 (Appendix 1D – Box 1), a mean of 9.3 PhD projects were completed per year. In 2015, it was decided to gradually increase the target from 10 to 15 completed PhD theses per year by attracting and admitting more students to the PhD program. For this reason, the PhD Research Proposal Writing Course is nowadays offered twice a year (see section 5.1). After 2018, we aim at a minimum of 12 completed PhD theses per year, which will then gradually increase to 15. Appendix 2H contains a list of the 56 PhD theses that were completed in the 2012-2017 period. In addition, SHE professors regularly co-supervise PhD candidates who graduate at other universities. An overview of these 22 PhD theses is included in Appendix 2I.

3.1.1. Ten Most Important Scientific Publications

Appendix 1F provides a list of top-10 publications. This list was chosen in order to find a good balance between (a) year of publication, (b) the different research themes studied in RiE, (c) the different types of journals SHE researchers publish in, (d) journals with a good impact (>1.329, which is the median impact factor of journals in the JCR category Education: Scientific Disciplines), and (e) articles with a good number of citations. The mean impact of the journals these 10 publications were published in is 7.714 and the mean number of citations is 115 (ranging from 14 for a 2017 publication to 261 for a 2013 publication), which we consider very good given that most of these are recent publications.

3.2. Demonstrable Use of Research Products by Peers

Use of research products by peers is reflected in the Hirsch indices of scientific staff and in numbers of citations. In the behavioral and social sciences, "... a Hirsch index of 20 after 20 years of scientific activity characterizes a successful scientist" (Bornmann & Daniel, 2007). In RiE, twenty researchers (51%) have a Scholar Hirsch index of 20 or higher; moreover, five full professors and one associate professor have a Scholar Hirsch index of 40 or higher (see Appendix 1B). Appendix 1D – Box 2 shows that for publications in JCR journals the mean number of citations is above 30 after a period of 5 years (36.3 for 2012 and 29.9 for 2013) and that the mean impact of the journals published in is around 3.0, while the median impact of journals in the JCR Category Education: Scientific Disciplines is 1.329. The high number of cites (456) to the book published in 2013 concerns the second edition of van Merriënboer and Kirschner's *Ten Steps to Complex Learning* (cites to the first edition have been excluded).

In bibliometric analyses, RiE is positioned in the top of the international field of health professions education. Rotgans (2012) reported that Maastricht University had the highest number of scientific publications in health professions education (295 publications), followed by Harvard University (224) and the University of Toronto (199). Prof. Cees van der Vleuten was the most productive author and two other SHE researchers also ranked in the top 10 (Prof. Albert Scherpbier and Prof. Diana Dolmans). Jaarsma et al. (2013) explored causes for this number-1 position of the Netherlands in the field of health professions education. The Netherlands is the only country that has more publications with a Dutch last author than with a Dutch first author. The last author typically has the role of PhD supervisor – thus, the Dutch are "exporting" their supervision: "Those who are acquainted with the medical education literature may readily acknowledge that Maastricht University has a dominant share in international collaborative research causing this finding" (p. 278). In a bibliometric analysis by Azer (2015), 5 of the 50 reported top-cited articles published in medical education journals were written by SHE researchers; another 5 of the 50 top-cited medical education articles published in all journals listed in the Web of Science were also written by SHE researchers. The bibliometric analysis of De Pinho et al. (2015) demonstrates that research on problem-based learning has increased considerably over the years and that a high number of the most influential studies were carried out by SHE researchers. Finally, in the most recent "rankings by subject" of the Center for World University Rankings (2017), Maastricht University ranked fifth in the JCR subject category "Education & Educational Research" and ranked *first* in the JCR subject category "Education: Scientific Disciplines" (see Appendix 2J).

3.3. Demonstrable Marks of Recognition from Peers

Marks of scientific recognition are given in Appendix 1D – Box 3. They include scientific awards, obtained research grants, invited lectures for scientific audiences, memberships of scientific committees, and editorships or memberships of editorial boards. SHE researchers regularly receive awards for their scientific contributions, ranging from fellowships of scientific organizations and honorary professorships for senior researchers, to best paper awards and best PhD thesis awards for junior researchers. Moreover, they deliver guest lectures for scientific audiences around the world and are very well represented in national and international scientific committees and editorial boards. Of special importance are full or associate editorships of key journals such as *Learning and Instruction* (van Merriënboer, 2009-2014), *Advances in Health Sciences Education* (Dolmans, 2006-; Schuwirth, 2011-), *Perspectives on Medical Education* (Driessen, 2013-; Stalmeijer, 2013-; Leppink, 2014-; van der Vleuten, 2013-), *BMC Medical Education* (Busari, 2014-; Driessen, 2012-2013; de Bruin, 2015-), *Evaluation and the Health Professions* (Driessen, 2010-2013), and *The Clinical Teacher* (Rethans, 2012-2013).

4. Relevance to Society

4.1. Demonstrable Research Products for Societal Target Groups

Table 4 (Appendix 1D – Box 4) gives an overview of the non-scientific output and Appendix 1D – Box 5 provides a list with this output. It should be noted that societal output has only been systematically collected and counted since 2014. The figures in Table 4 (Appendix 1D – Box 4) and the information in Appendix 1D - Box 5 are thus not fully complete but nevertheless provide a good impression of the practical relevance and impact of the SHE research program. In addition to policy reports, professional publications, and publications aimed at a general public, the output also includes software tools, interviews, translations of articles and books for non-scientific audiences, and so-called AMEE guides which are published by the Association for Medical Education in Europe.

Table 4 (Appendix 1D – Box 4). Main categories of non-scientific output by SHE/RiE.

RiE	2012	2013	2014	2015	2016	2017
Policy reports	3	0	0	6	0	12
Professional publications	11	8	3	6	10	2
Publications aimed at general public	6	7	3	0	0	3
Other professional research output[a]	11	8	19	7	4	21
TOTAL	**31**	**23**	**25**	**19**	**14**	**38**

[a]Other *professional* research output includes software tools, interviews, translation of articles/books for a non-scientific audience, and AMEE guides (see Appendix 1D – Box 5).

4.1.1. Ten Most Important Societal Products: Narratives and Anecdotic Information

Appendix 1G provides short narratives of top-10 products for non-scientific groups. This list was chosen in order to find a good balance between different types of products and different audiences. The types of products include evidence-informed educational models (4C/ID, programmatic assessment, cognitive load theory, problem-based learning), educational software products (EPASS, PRoF for progress testing), collaborative projects with an immediate societal relevance (Pasemeco, SafePat, Cost-Conscious Care), and international user groups (EBMA). Audiences include educators, educational administrators, professional educational designers, developers of educational software, and others. Overall, RiE has a very strong impact on education in the health professions: Developed models, tools, and instruments are very well received and widely used on both a national and international scale.

4.2. Demonstrable Use of Products by Societal Groups

As previously mentioned, SHE adopts a “double-chain approach” to maximize its societal relevance. Graduates from the SHE research-based educational programs that are part of the educational chain provide the first - albeit indirect - evidence for the societal relevance of RiE. Students are medical doctors, nurses, midwives, physiotherapists, dentists, veterinary doctors, etc. with a strong interest in education and

educational innovation. Many of them first became acquainted with the SHE via its short courses or certificate courses. Short courses include the PBL Summer Course which offers an introduction to the Maastricht system of Problem-Based Learning; Research in Medical Education which is a course taught in Dutch and offered in conjunction with the NVMO (the Netherlands Association for Medical Education), and Research in Essential Skills in Medical Education which is an international course offered in conjunction with the AMEE. Certificate courses include Curriculum and Instruction, Organization and Leadership, Assessment and Evaluation, and Workplace-Based Learning; certificates obtained exempt students from taking equivalent courses in the MHPE program. The MHPE and PhD programs qualify participants to fulfill leading positions in hospitals, medical schools, and other healthcare-related institutions around the world - as educational deans, program directors, innovation managers, and so forth. As educational leaders they use approaches, models, and guidelines that were developed in RiE and thereby greatly contribute to its societal impact.

A second piece of strong evidence for the societal relevance of RiE is provided by direct valorization activities, notably SHE Collaborates and SHE Bytes. Officially started in 2012, *SHE Collaborates* is an activity that has the mission to improve healthcare globally by helping higher education institutes realize educational innovations. SHE Collaborates offers tailor-made courses, support, and consultancy on PBL and task-centered learning, innovative e-learning tools, faculty development, assessment and evaluation, and quality control and assurance. In the period spanning 2012-2017, projects were conducted in Georgia, Ghana, Indonesia, Kazakhstan, Kenya, Mexico, Mozambique, Oman, Pakistan, Portugal, Qatar, Saudi Arabia, Ukraine, Vietnam, and Yemen. In 2017, SHE Collaborates recorded a turnover of 1.2 million euro. SHE Bytes is an activity that was previously conducted under the responsibility of the Educational Institute of the FHML. Its aim is to bring educational software to the market (e.g., EPASS, Testlife). The products are also used in the FHML and other faculties of Maastricht University. In 2017, SHE Bytes recorded a turnover of 0.4 million euro. Revenues of valorization activities are partly rechanneled into research and greatly reinforce the success of the school.

Third, there is strong evidence that the societal products listed in section 4.1 are widely used in educational practice. As becomes evident from Appendix 1D – Box 5, SHE researchers are regularly interviewed about their work, developed software tools are used worldwide, and descriptions of educational models have been translated into different languages. Special mention can be made of the so-called *AMEE Guides* (https://amee.org/publications/amee-guides) which provide practical guidelines for educators. In the last six years, SHE researchers produced eight of these much-used practical guides. Finally, the narratives presented in Appendix 1G provide additional evidence for the extensive use of our top-10 products.

4.3. Demonstrable Marks of Recognition by Societal Groups

Appendix 1D – Box 6 gives an overview of demonstrable marks of recognition by societal groups, in the form of joint projects with societal groups, public prizes, memberships of civil society advisory bodies, and invited lectures for non-scientific audiences. This overview indicates that the practical educational value of the research conducted in the SHE is widely recognized. Many researchers in SHE are not only scientifically active, but also involved in societal projects in the field of education and beyond. Another sign of recognition by societal groups is provided by the appointment of SHE's affiliated professors (see section 2.2), whose one-day research appointment is paid for 50% by the hospital or healthcare institution where they have their primary appointment.

5. PhD Program and Overall Talent Policy

5.1. PhD Program

The PhD program is an integral part of RiE, in which junior researchers learn to independently conduct high-quality educational research in the health professions. They write a PhD thesis containing at least four separate studies that are described in journal articles, of which at least two have been published or are in

press in JCR journals, plus an Introduction and a General Discussion chapter. The program has two branches. First, it encompasses a *regular PhD program* which contains PhD projects that are paid by external funding organizations or, to a much lesser extent, by RiE itself. PhDs in the regular PhD program work at least 0.8 FTE on their research for four years and are housed by the school. Second, it offers an *international PhD program* which contains PhD projects that are typically submitted by participants from the PhD Research Proposal Writing Course. After formal approval of their PhD proposal, candidates are admitted to the international PhD program with student status and pay an annual fee of 3,220 euro for supervision. They typically combine their PhD with a job as a health professional but they are expected to work at least 0.4 FTE on their research for a period of four years. They are not housed by the SHE and typically collect research data in their own institution. Apart from the reserved research time, all procedures and requirements are identical for PhDs in both the regular and the international program.

Selection for and admission to the regular PhD program takes place according to the normal procedures for hiring employees: Vacancies are advertised on Academic Transfer and other relevant websites, candidates are selected on the basis of their CV and motivation letter, and the final selection is based on job interviews. Selection for the international PhD program is mainly organized through the PhD Research Proposal Writing Course, which starts twice a year in October and in March and runs through to March (of the next year) or October, respectively. Admission to the course depends on possession of a Master's degree in (health professions) education, the quality of the Master's thesis and/or possible prior publications in JCR journals on health professions education - about 1/3 of all applicants is not admitted to the course. Students who have taken the "research track" of our own MHPE program and who achieved excellent study results are encouraged to continue in the PhD program; the two most talented MHPE graduates can apply for free participation in the course.

Each course starts with about 10 prospective PhD candidates. In the first face-to-face part, which takes 8 days, they follow workshops and have meetings with their supervisors in Maastricht. In the second part, they work on their proposal and are supervised at a distance. A go/no-go decision is made halfway the course; of the ones who were initially admitted to the course, another 1/3 does not proceed to the third part. After five months, the remaining candidates return for the third part of the course, which is again face-to-face. This last part takes 4 days during which time participants finish their PhD proposal and submit it online on "e-press" (an online submission and review system) where it is sent out for review to two SHE faculty members. Reviewers advise the Research Director of the SHE to reject, accept, or ask for a revision of the research proposal; over the last years, about 90% of the proposals prepared in the course were formally accepted, usually after a last round of revisions (keep in mind, however, that this is a mere 40% of all the applicants who originally applied, as 1/3 did not get accepted, while another 1/3 of the remaining participants was not admitted to the second part). Although nowadays about 80% of the candidates enter the international PhD program through the PhD Research Proposal Writing Course, it is also possible to directly submit a PhD research proposal in e-press (20% of all applicants do so). Few proposals in this latter category eventually get accepted (< 20%). When a PhD research proposal is rejected, candidates are not allowed to resubmit for one year.

In both the regular and the international PhD program, each accepted PhD candidate is supervised by a first supervisor (who must be a full professor, called *promotor* in Dutch) and one or two co-supervisors, one of whom is the "daily supervisor." The co-supervisors must have a PhD degree themselves and are appointed based on their expertise in the topic and their experience in supervising PhD candidates. In the case of international PhD candidates, the second co-supervisor who is not the daily supervisor is often affiliated with the home institution of the candidate (i.e., s/he is a "local" co-supervisor). PhD candidates meet at least once a week with their daily supervisor and once a month with their promotor. For international PhD candidates, these meetings take place via Skype.

Regular PhD candidates and staff of RiE participate in the Interuniversity Center for Educational Sciences (ICO, see www.ico-education.nl) and in the Netherlands Association for Medical Education (NVMO, see www.nvmo.nl). Regular PhD candidates typically take courses at Maastricht University, ICO, and NVMO.

International PhD candidates search for courses in their local environment, follow online courses, or come to Maastricht University. All regular PhD candidates are expected to fulfill the ICO requirements and earn an ICO certificate; for international PhD candidates, there are no strict requirements regarding the number of courses they should take or ECTS credits they should earn. Their course program is tailored to their individual needs and established in their Training and Supervision Plan. PhD candidates are also supported by methodological and statistical experts (for quantitative research: Dr. Arno Muijtjens, Dr. Jimmie Leppink, Dr. Shahab Jolani; for qualitative research: Dr. Janneke Frambach, Dr. Renee Stalmeijer) and an English language editor (Angelique van den Heuvel, MA).

The online monitoring system "TRACK" plays a central role in monitoring the trajectory and assuring progress of the PhD candidates. All PhD candidates register in TRACK at the start of their PhD and describe in their Training and Supervision Plan what educational goals they wish to pursue and what courses should be taken. Every 6 months, PhD supervisors and candidates evaluate progress and determine a course of action if needed. Since constructive collaboration is known to be central to the success of a PhD project, at the start of the PhD trajectory PhD candidates and their supervisors discuss how they will collaborate and communicate using the "PhD Team Tool," developed by the PhD coordinator and PhD representatives. The PhD Team Tool collects PhD team members' wishes on collaboration and communication, which are then shared in a joint meeting. Moreover, SHE PhD supervisors meet twice a year in "peer coaching meetings" where they discuss progress of their PhD candidates and topics such as providing feedback on writing and cross-cultural collaboration. A confidential counselor (Dr. Herma Roebertsen) is available to advise PhD candidates on issues they prefer not to discuss with their supervisory team.

PhD candidates and RiE staff members discuss ongoing PhD research four times a year in Web-streamed presentation sessions called "SHE Presents." New PhD candidates introduce themselves in online "SHE presents new candidates" meetings. Recently published research is discussed four times a year in "journal club meetings." Since 2017, there is also a "PhD Student Social Network Tool" available that helps PhD students to locate and contact fellow PhD students with similar research interests. Moreover, PhD candidates have the opportunity to participate in the biannual SHE PhD community-building conference "SHE Academy" (www.she-academy.org) held in Maastricht. During this four-day conference, PhD candidates share and discuss research ideas, participate in workshops on academic or research skills, and meet their supervisors to discuss progress. An evaluation among PhD candidates revealed that they rated the quality of the 2017 SHE Academy as 4.2 on average (on a 5-point Likert scale). Finally, SHE PhD candidates can further hone their research skills and continue community building during half-day "SHE Mini-academies" taking place biannually before the AMEE Conference.

5.2. PhD Duration and Success Rate

Tables 5 and 6 (see also Appendix 1E - Box 1 and Box 2) present the success rates of PhD candidates. A distinction is made between regular PhD candidates, who have a full-time or near full-time research appointment (≥ 0.8 FTE) for a period of four years (Table 5; for a list of these candidates, see Appendix 2K), and part-time PhD candidates (< 0.8 FTE), consisting of international PhD candidates and candidates with an appointment of only 1 or 2 days per week (Table 6; for a list of these candidates, see Appendix 2L). Table 5 reveals that 19% of the regular PhD candidates who started between 2008 and 2014 completed the program within 4 years and another 50% did so within 5 years. So, cumulatively, 69% of the candidates completed the program within 5 years. We did not correct for maternity leave or prolonged illness. No dropout is observed among regular PhD candidates. Note also the increase in enrollment of regular PhDs: from an average of 2.3 PhDs starting per year in the period spanning 2008-2014 to an average of 6 PhDs starting per year in the period from 2015-2017. As for part-time PhD candidates, Table 6 uncovers that a cumulative 38% of candidates graduate within 5 years, even though they typically combine their PhD project with a job. Over this same period, the dropout rate is 15%, while the majority (82%) of the PhD candidates who started before 2015 and still have to complete the program (33%) started in 2013 or 2014.

Table 5 (Appendix 1E – Box 1). Duration and success rates of PhDs with a 0.8-1.0 FTE appointment/contract[a].

Enrollment				*Success rates*											
Starting year	*Enrollment M /F*		*Total M+F*	*<= 4 years*		*<= 5 years*		*<= 6 years*		*<= 7 years*		*Not yet finished*		*Discontinued*	
	M	*F*	*#*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*
2008	1	3	4	1	25%	3	75%	0	0%	0	0%	0	0%	0	0%
2009	0	3	3	1	33%	2	67%	0	0%	0	0%	0	0%	0	0%
2010	0	1	1	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%
2011	1	2	3	1	33%	0	0%	2	67%	0	0%	0	0%	0	0%
2012	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-
2013	1	3	4	0	0%	3	75%	-	-	-	-	1	25%	0	0%
2014	0	1	1	0	0%	-	-	-	-	-	-	1	100%	0	0%
Subtotal	**3**	**13**	**16**	**3**	**19%**	**8**	**50%**	**3**	**19%**	**0**	**0%**	**2**	**13%**	**0**	**0%**
2015	1	5	6	-	-	-	-	-	-	-	-	6	100%	0	0%
2016	1	2	3	-	-	-	-	-	-	-	-	3	100%	0	0%
2017	2	7	9	-	-	-	-	-	-	-	-	9	100%	0	0%
Subtotal	**4**	**14**	**18**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**18**	**100%**	**0**	**0%**
Total	**7**	**27**	**34**	**3**	**9%**	**8**	**24%**	**3**	**9%**	**0**	**0%**	**20**	**59%**	**0**	**0%**

[a]PhDs with employee status and contract PhDs with scholarships (Regular PhD program).

Table 6 (Appendix 1E – Box 2). Duration and success rates of PhDs with a < 0.8 FTE contract[a].

Enrollment				*Success rates*											
Starting year	*Enrollment M /F*		*Total M+F*	*<= 4 years*		*<= 5 years*		*<= 6 years*		*<= 7 years*		*Not yet finished*		*Discontinued*	
	M	*F*	*#*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*	*#*	*%*
2008	4	4	8	3	38%	2	25%	1	13%	2	25%	0	0%	0	0%
2009	2	6	8	1	13%	2	25%	1	13%	1	13%	0	0%	3	38%
2010	2	1	3	1	33%	0	0%	0	0%	1	33%	1	33%	0	0%
2011	2	8	10	2	20%	3	30%	1	10%	1	10%	1	10%	2	20%
2012	5	5	10	5	50%	2	20%	1	10%	--	--	2	20%	0	0%
2013	7	8	15	2	13%	0	0%	--	--	--	--	8	53%	5	33%
2014	9	4	13	3	23%	--	--	--	--	--	--	10	77%	0	0%
Subtotal	**31**	**36**	**67**	**17**	**25%**	**9**	**13%**	**4**	**6%**	**5**	**7%**	**22**	**33%**	**10**	**15%**
2015	7	7	14	--	--	--	--	--	--	--	--	11	79%	3	21%
2016	9	9	18	--	--	--	--	--	--	--	--	16	89%	2	11%
2017	2	9	11	--	--	--	--	--	--	--	--	10	91%	1	9%
Subtotal	**18**	**25**	**43**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**37**	**86%**	**6**	**14%**
Total	**49**	**61**	**110**	**17**	**15%**	**9**	**8%**	**4**	**4%**	**5**	**5%**	**59**	**54%**	**16**	**15%**

[a]Contract PhDs with student status (International PhD program) and employees who work part-time on their PhD.

5.3. The School's Talent Policy

The SHE aims to optimally support talented researchers who show great potential. All researchers including regular PhD students have annual performance appraisals, and PhD candidates in the international PhD program have progress meetings with their supervisors two times a year (initiated by an email from TRACK). Those meetings are particularly intended to explore career opportunities, agree on performance goals, and to identify candidates who may qualify for personal research grants. Such grants include the Kootstra Talent Fellowship, which is awarded by the FHML to excellent students to bridge the gap between graduation and a PhD position (such a Kootstra Talent Fellowship was awarded to Koos van Geel, M.D., in 2015) or between a PhD and postdoc position (from 2017 onwards, the Fellowship has been limited to this latter category). Talented PhD candidates who are in the final years of their PhD project are afforded the opportunity to participate in courses that help them prepare a research proposal for external funding, receive intensive guidance from senior researchers and the Grants Office of the FHML while writing these proposals, and are stimulated to spend some time abroad in excellent research groups. Courses aimed at the preparation of research grants are offered by Maastricht University (e.g., "Training grants for

individuals"), but the SHE also organizes workshops in which young researchers who have been successful in obtaining grants share their experiences.

A recent survey (Fall 2017; see Appendix 2M) held among 37 SHE PhD alumni (from 2000-2017; 86% graduated after 2008; 43% Dutch; 13 nationalities) revealed that 44% of the alumni occupy an educational management position (e.g., faculty department chair, dean, vice dean, head skills lab), 38% have an academic position (e.g., assistant or associate professor), and 18% work as clinicians. Before starting the PhD trajectory, 16.2% of their job activities were related to educational management; after completing the PhD trajectory, 25.4% of their job activities were related to management, whereas the job activities related to teaching dropped from 27.6% to 22.4%. Doing research (21.8% before, 21.9% after) and administration (9.2% before and 9.3% after) stayed the same. Together, this shows that the SHE PhD program has a positive impact on alumni's educational leadership positions. This is also corroborated by a score of 4.1 (on a 5-point Likert scale) for the question "My completion of the SHE PhD program resulted in promotion/advancement in my academic rank."

When asked (in an open-ended question) to indicate what characteristics of the SHE PhD program were most beneficial to their development as a scholar, in 44% of the responses alumni mentioned their supervisors as highly contributing, in 11% they mentioned the PhD Research Proposal Writing Course, and in 11% they mentioned publishing in international journals. When asked (in an open-ended question) what characteristics of the SHE PhD program could be improved, in 37% of the responses the alumni mentioned more networking among peers and alumni, and in 11% of the responses they mentioned a need for more research methods courses. In response to this, we will organize future Journal Club Meetings online so that international PhDs can participate in them and the FHML is exploring options to offer more research-methods courses online (both qualitative and quantitative methods). Furthermore, communication with alumni has been intensified (e.g., by adding specific information to the SHE Communicates newsletter) and plans for further strengthening of the relationship between alumni and the SHE are developed in collaboration with SHEILA, which is the alumni organization of the school.

6. Research Integrity

Maastricht University has a Regulation for Scientific Integrity and two UM Counselors on Scientific Integrity (Prof. Gerjo Kok and Dr. Ree Meertens) who are the contact persons for questions or complaints concerning scientific integrity. The Maastricht UMC+ and the FHML adhere to the principles laid down in the Maastricht Regulation for Scientific Integrity and in the Netherlands Code of Conduct for Research Integrity (VSNU). An FHML committee on scientific integrity set these principles out in an own Research Code, which is available in Dutch and English on the website of the FHML Research Office. This committee also participates in the Maastricht University Research Ethics and Integrity Platform to facilitate sharing of best practices and expertise in this field. It also aims at increasing awareness of research integrity among students and staff, for example, by organizing special "Days on Research Ethics."

The SHE complies with university and Maastricht UMC+ regulations and fully acknowledges that good ethical practice and data management are of crucial importance at all stages of a research project. The policies it operates are described on the SHE website under "Research Ethics and Data Management" (see https://she.mumc.maastrichtuniversity.nl/research-ethics-data-management). In the PhD Research Proposal Writing Course, future PhD candidates are informed about the school's policies and (a) participate in a session on research integrity called "Sloppy Science" (taught by Prof. Erik Driessen), (b) participate in a session on data management (taught by Dr. Jimmie Leppink, who is the data manager of the SHE), and (c) play the "Dilemma Game," which is a card game developed at Erasmus University that invites participants to discuss how they would handle particular scientific ethical dilemmas. All new researchers (including regular PhD candidates) who receive a contract from the human resources department are informed about the Netherlands Code of Conduct for Research Integrity of the VSNU and the local Research Code. Upon registration in the monitoring system TRACK, new PhD candidates receive a message via TRACK to sign the declaration of academic integrity; this procedure applies to both full-time and part-time PhD students. By

signing this form the PhD candidate declares that he or she shall adhere to the principles laid down in the Netherlands Code of Conduct for Research Integrity of the VSNU.

During a PhD project, integrity issues are discussed in the regular supervision meetings and in the SHE Academy. For example, in the 2017 SHE Academy Prof. Jelte Wicherts, a professor of methodology at Tilburg University, gave a lecture titled "Weak spots in science and ways to improve reproducibility and replicability." ICO also organizes workshops on scientific integrity and data management that can be attended by SHE PhD candidates and staff. When problems occur during a PhD project, they are discussed in the PhD peer-coaching meetings for PhD supervisors; half of these meetings are devoted to the discussion of concrete problems with PhD supervision (not only integrity issues, but also on how to deal with feedback, progress problems, intercultural issues, etc.). SHE staff members also participate in relevant courses offered by the FHML, such as the pilot course Competence Development for Supervisors; a workshop on supervision and scientific integrity is part of this course.

All SHE research projects require ethical approval. International PhD candidates typically obtain ethical approval from their own university or hospital. SHE researchers who are located in the Netherlands, however, obtain such approval from a centralized Ethical Review Board organized by the NVMO; Dr. Karen Könings is a member of the NVMO ethical committee. Since 2017, a new FHML Research Ethics Committee (FHML-REC) has been in place for non-medical research involving human participants. Dr. Karen Könings also participates in this new committee that might possibly take over part of or all the work of the NVMO ethical review board. Participants in SHE research projects must always fill out an informed consent form; example forms can be downloaded from the SHE website.

The SHE is currently implementing a data management plan for the safe use and storage of all research data. Data are stored on Maastricht University's secure J-drive as well as on SURFdrive. Additionally, all research data will be registered on Dataverse, a system for archiving of research data that is used by several Dutch universities and supported by DANS (see www.dataverse.nl). If anonymization or pseudonymization is possible, data are stored on Dataverse so that, on request, they can be made available to other researchers for replication studies (eventually after encryption). Following the FAIR principle, data stored on the J-drive or Dataverse are findable (F) and accessible (A) upon request and reusable (R) as long as data can be anonymized or pseudonymized. With regard to interoperability (I), standards for common vocabulary or ontology will need to be further established in the field of health professions education research. PhD candidates that finished their project are granted permission to defend their thesis only after all data necessary for re-analysis of published findings (e.g., questionnaires, coding schemes, log files, SPSS data, and syntax files) have been stored on the J-drive and/or Dataverse.

7. Diversity

In line with the Maastricht University 2017-2021 Strategic Plan, the SHE continuously strives to increase its PhD student and staff diversity in terms of gender, age, and ethnicity. As indicated by the Midterm Review Committee, the great diversity of part-time PhD students is not fully reflected in the diversity of staff and full-time PhD students. In order to increase diversity, the SHE has a differentiated human resource and talent management policy, in which the issue of diversity plays a central role. In doing so, we specifically want to address the issue of gender equality and diversity. We believe that with a differentiated human resource policy, all the SHE staff should be able to flourish and work to their highest potential.

Over the last years, attempts to increase diversity of staff and full-time PhD students have had some success. As for staff, 64% of the assistant professors is female; 60% of the associate professors is female; 33% of the full professors is female; and 13% of all staff is non-Dutch, with 5 staff members coming from the UK, Germany, Iran (2x), and Belgium (see Appendix 1B). As to regular PhD students, 26% is non-Dutch, with 9 students coming from Barbados, Germany (3x), Malaysia, South-Korea, China, Russia, and Ethiopia (see Appendix 2K). This is still in contrast with the highly diverse group of part-time PhD students, of which 68% is non-Dutch coming from 30 different countries (see Appendix 2L).

8. Trends, SWOT, and Strategic Plans

8.1. Trends

The field of health professions education is changing rapidly and new units are emerging all over the world. In essence, this is a positive development since it will promote further professionalization of health professions education. Yet, it profoundly changes the context in which the SHE is operating. We are witnessing an explosion in the number of conferences, scientific journals, and educational programs in health professions education all over the world. For example, in 1996 there were only 7 MHPE programs worldwide; in 2014, already 121 MHPE programs were counted (Tekian et al., 2014). This development is expected to continue in the decade to come. Thus, it is not self-evident that the SHE will keep its world-leading position; it needs to capitalize on its strengths which are mainly based on its research and PhD program and claim a unique position in the world of the health professions.

8.2. The SWOT Analysis

Table 7 provides an overview of the strengths, weaknesses, opportunities, and threats for RiE. Research in the SHE, in our view, is characterized by five strong points. First, and most importantly, it has an excellent international reputation, which is evidenced by its many international PhD candidates, its strong research network, and its signs of scientific recognition: The SHE is regularly proclaimed as the best medical education research institute worldwide. Second, it has a high research output, which is evidenced by its number of publications in peer-reviewed journals and bibliometric analyses as well as the number of completed PhD theses. Third, it has a strong societal impact to which the graduates from its educational programs, its affiliated and educational professorships, and its research products for teachers and societal groups bear witness. In addition, the SHE has been able to develop successful valorization activities (SHE Collaborates, SHE Bytes) which revenues complement traditional research funding. Fourth, it offers PhD candidates a good support structure, not only through its well-organized supervisory scheme but also because of the availability of methodological, statistical, and English-editing experts; this enables PhD candidates to develop their research skills through guided learning-by-doing. Last but not least, RiE is a multidisciplinary research group that is home to researchers with a background in the health sciences, educational sciences, psychology, sociology, computer sciences, cultural sciences, management sciences, and other fields. This provides the opportunity for cross-fertilization and developing new educational models, guidelines, and approaches that are rooted in different disciplines.

Table 7. SWOT analysis for SHE/RiE.

Strengths: - Excellent international reputation - High research output - Strong societal impact and valorization activities - Good PhD support structure - Multidisciplinary group with cross-fertilization	*Weaknesses:* - Control over progress of international PhDs - Staff diversity - Internal visibility
Opportunities: - Extra research focus on improvement of care - Connect more to paramedical fields - Orientation on the region - Develop Research Master in health professions education	*Threats:* - Forced standardization of PhD programs - Rapid appearance of new technologies that have an impact on the way research is conducted - Staffing and succession planning

We identified three weaknesses. A first weakness relates to the limited control over progress of international PhD candidates who typically combine their PhD research with a job in the health professions and who are often at an age they must take care of children. Although TRACK is used to monitor progress of PhD candidates, it proves difficult to prevent delays because they are often caused by personal and job-related issues, not by problems in the PhD project itself. Yet, a stronger relatedness with the PhD community might help PhD candidates to stay on schedule, which is why we have taken several new actions to reach this goal as was previously discussed in this report (e.g., online journal club meetings, the

PhD Student Social Network Tool). A second weakness relates to staff diversity. The share of international staff has increased over the last six years, but in order to better reflect the composition of the student population a larger share of international researchers is still desirable and might open up new networking and funding possibilities. Therefore, we will strengthen our international recruitment, using networks such as AMEE and the International Network for Health Workforce Education. Finally, compared to its very strong international reputation, the internal visibility of research conducted in the SHE is too limited in the FHML and Maastricht University. In collaboration with the FHML Educational Institute and with EdLab, which is the Maastricht University institute for educational innovation, funding for new research and development projects in our own educational programs will be sought (e.g., through the Comenius program and the new program for Practice-oriented Research in Higher Education, which are both funded by NWO).

Four promising opportunities include the following. First, RiE could profit from doing more educational research with a focus on improving care through education rather than improving education per se. With the aid of its affiliated professors, it should be possible to apply for research funding from programs that focus on improving care using educational theory, such as ZonMw programs or health programs in Horizon 2020. Such a focus on improving care would also make it easier to strengthen collaboration with the other schools in the FHML. Second, the SHE could pay more attention to doing research on education in the paramedical professions, such as nursing, midwifery, dentistry, physiotherapy, dietetics, care technology, et cetera. Historically, research has focused on training medical doctors. A further broadening to other health professions will not only attract new target groups and open up new markets, but also increase opportunities for doing research in the growing field of *interprofessional* education. Low-hanging fruit in this respect is strengthening the collaboration with the nursing programs offered by the Maastricht UMC+ Academy. The third opportunity is a stronger orientation on the region, including not only the southern part of the Netherlands but also the Meuse-Rhine Euroregion with the major cities of Hasselt-Maastricht-Liège-Aachen-Heerlen-Eupen. Strengthening collaborations with higher education institutes and schools for senior vocational education in the region can also help to do more research on education in the paramedical professions and interprofessional education. Fourth, the educational chain in the SHE can be further strengthened by starting a Research Master in health professions education. This would reinforce the profile of the SHE as a top graduate research school and also give it a unique position in the international field, because as yet there exists no Research Master in health professions education. To prepare for such a Research Master, we already developed the PhD Research Proposal Writing Course and two new online courses: Research on Task-centered Learning Environments and Research on Assessment of Professional Competence.

To conclude this SWOT analysis, we see three threats for RiE. First, there is a European movement to impose more and more requirements on the amount of coursework that must be part of a PhD program, the so-called "standardization of the third cycle" (see http://www.orpheus-med.org). This might jeopardize the flexibility and attractiveness of our international PhD program, which emphasizes guided learning-by-doing rather than compulsory coursework for all PhD candidates. The development of a Research Master might - at least in part - reduce this threat because the second year of the Master can then be seen as focused preparation for the PhD project which could shorten the length of the PhD trajectory. Second, there are very rapid changes in technologies and regulations that have an impact on research in health professions education, such as big data, learning algorithms and learning analytics; radically new statistical and methodological approaches, and new legislations on data protection and privacy. It proves difficult to bring in and/or develop all the expertise that is needed to deal with these new developments fast enough; apart from bringing in this expertise in the SHE, strategic alliances will be developed with relevant partner institutes such as the new Maastricht Institute for Data Science (Prof. Michel Dumontier). A final challenge lies in staffing: the SHE likes to seek and attract more international staff and young talents and also to take a proactive approach to succession planning (both Prof. Cees van der Vleuten and Prof. Jeroen van

Merriënboer will retire in 5-8 years). An interesting option might be to offer talented international PhD students a postdoc position after completing their PhD and/or to appoint them in a tenure-track position.

8.3. Strategic Plans

The SWOT analysis has been part of a larger process of strategy development starting mid-2017. This process was supported by a consultancy firm (TopChange) and guided by Prof. Karl Dittrich and Prof. Wil Foppen (Appendix 2D). The resulting strategy will be finalized in 2018 and also take the input of the research assessment committee into account. Capitalizing on the strong research profile of the SHE and further strengthening the synthesis between research, education, and valorization are cornerstones of the new strategy. The main strategic research aims for the next six years are to:

1. attract new staff members who further increase diversity in terms of both disciplinary background and nationality and who can contribute not only to research and education, but also to valorization. *Actions*: more international recruitment, offer highly talented international PhD candidates a postdoc or tenure-track position after they have completed their PhD;
2. gradually increase the number of completed PhD projects to 15 per year, given the growth of the PhD program over the last years. *Actions:* raise the intake of PhD candidates (we already achieved this goal, by offering the PhD Research Proposal Writing Course twice a year); strengthen the PhD community further to stimulate progress and success rates (online journal club meetings, PhD Student Social Network, etc.);
3. further increase the impact of SHE/RiE both internally (i.e., Maastricht University, FHML, Academic Hospital of Maastricht) and regionally (i.e., care institutes/hospitals and educational institutes in Limburg and the Meuse-Rhine Euroregion). *Actions*: apply for funding for research in and development of own educational programs (e.g., NWO Comenius, NWO practice-oriented research in higher education); involve affiliated professors and other FHML schools in funding applications for programs with a focus on improving care through education rather than education per se;
4. expand research in paramedical fields outside medicine and start more - interprofessional - projects. *Actions*: intensify collaboration with the nursing programs offered by the Maastricht UMC+ Academy; strengthen collaboration with universities of applied sciences and schools for senior vocational education in the field of interprofessional education;
5. investigate the feasibility of a Research Master in Health Professions Education, which will be unique in the field of health professions education, strengthen the profile of the SHE as a top research institute, and help to be prepared for a possible standardization of the third cycle. *Actions*: develop two new online courses that could become part of a new Research Master; form a preparation committee (chaired by Dr. Karen Könings). Both actions have already been completed.

9. Viability

Over the last six years, SHE/RiE has substantially grown in terms of amount of funding, staff, and PhD students in order to be able to maintain its world-leading position in the fast-growing field of health professions education. For the coming six-year period, the focus will be less on expanding our activities in new directions and more on capitalizing on our strengths. The main aims include the further diversification of staff with regard to both nationality and expertise; a gradual increase of completed PhD projects to 15 per year; strengthening of local and regional visibility; the launch of more research projects in paramedic domains and interprofessional education; and an exploration of the promise of a unique Research Master in health professions education in order to reinforce SHE's strong research profile. Discussions on succession planning for the SHE directors have started but given the high quality of senior staff in the SHE no insurmountable obstacles are foreseen. We face the future with confidence.

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Appendix 2e

PhD Alumni survey 2020

All SHE PhD graduates who graduated between 2011 and 2020 were invited by email to participate in this survey. In total, 105 invitations were sent. Five email addresses were inactive. 56 graduates responded. Not all graduates responded to all items. Data were collected from December 15, 2020, to January 31, 2021.

1. **I finished the PhD programme (defended my thesis) in:**

Year	%	Count
2020	22.22%	12
2019	7.41%	4
2018	11.11%	6
2017	0.0%	0
2016	9.26%	5
2015	7.41%	4
2014	11.11%	6
2013	7.41%	4
2012	12.96%	7
2011	11.11%	6
Total	100%	54

2. **My current country of residence is:**

Argentina	2
Australia	2
Austria	1
Belgium	1
Brazil	1
Canada	6
Denmark	3
Ghana	1

Indonesia	1
Ireland	1
Japan	2
The Netherlands	17
New Zealand	1
Pakistan	1
Philippines	2
Saudi Arabia	1
Switzerland	2
United Kingdom	3
USA	3
Vietnam	1
TOTAL	52

3. My job activities before receiving my PhD were :

Field	Mean % of appointment	Count
Administration	7.04	54
Clinical work	18.89	54
Teaching	20.46	54
Educational research	25.93	54
Educational management	16.30	54
Other	11.39	54
TOTAL	100.0	

4. My main current job activities are related to:

Field	Mean % of appointment	Count
Administration	8.61	54
Clinical work	22.22	54
Teaching	16.83	54
Educational research	23.94	54
Educational management	13.39	54
Other	15.00	54
TOTAL	100.0	

5. My completion of the SHE PhD programme resulted in ...

Question	Mean	Std Deviation	Count
... receiving a research leadership position	3.5	1.2	45
... receiving an educational leadership position	3.7	1.3	44
... promotion/advancement in my academic rank	4.1	1.1	48
Had a positive impact on my development as a scholar	4.7	0.8	48
... establishing an international network of educational research	3.6	1.3	45
... establishing an international network of educational innovation	3.4	1.4	45
The relationships with SHE researchers led to development of professional relationships/collaborations	3.9	1.3	46

(five point Likert scale, 1 = strongly disagree, 5 = strongly agree)

6. To what extent have you experienced attention from SHE for the following aspects:

Topic	Mean	Std Deviation	Count
Research integrity and research ethics	4.1	1.1	26
Open Access publishing	3.2	1.1	26
Storing research data according to the FAIR principles (Findability, Accessibility,Interoperability,Reusability)	3.3	1.0	26
Appreciating the multiplicity of perspectives and identities in the research environment	3.8	1.3	26
Career development	3.4	1.4	26

(five point Likert scale, 1 = not much, 5 = a great deal)
NB. Data for item 6 are reported for graduates 2016-2020 given increasing interest in these topics in the last 5 years

7. Did you publish in SSCI-indexed journals in the health professions educational domain in the last 5 years?

Answer	%	Count
Yes	82.61%	38
No	17.39%	8
Total	100%	49

8. If yes, how many publications?

No. of publications	Count
1-5	21
6-10	3
11-20	7
>20	7
Total	38

9. Did you publish in non-SSCI-indexed journals in the health professions educational domain in the last 5 years?

Answer	%	Count
Yes	45.8%	22

No	54.2%	26
Total	100%	48

10. If yes, how many publications?

No. of publications	Count
1-5	16
6-10	1
11-20	1
>20	0
Total	18

11. What characteristics of the SHE PhD programme were most beneficial to stimulate your development as a scholar and your professional network?

Selected responses:

I think it is the quality and the standard, because the goal for all researches is to be published. Obviously one can not published old information so it is imperative to come up with new data, new insights, new applications and new findings. So all these motivated PhD candidates to work hard and propose new concepts or theories.
Excellent supervision and the ability to receive effective feedback efficiently. Develop a very good understanding of the state of medical education research and how much needs to be done in my country (Australia).
The collaboration and expertise of my supervisors
Continuous personal feedback and competent supervisors. No doubt. The supervisors are the assets for the UM PhD programme especially the way feedback is delivered and the outcome of contributing to literature via continuous publication. This part is helping me a lot when I pursue my future career as a lecturer. This part is stunning, if I compared to other PhD programme from other countries/ institution. I learn a lot from this process. Also the warmth personal relationship.
The international high standard in research and academic practice. The opportunity to amplify my international professional network.
Quality of supervision whatever my (diverse) needs Friendly and welcoming for networking/inclusivity
The development of the supervisory committee with three leading scholars in three different countries, each with particular areas of expertise, supported both my advancement as a scholar and my professional network. The latter further expanded through the Assessment and Defence Committees. My development as a scholar was very strongly supported by publishing in well respected, international journals - via the review process required for such publications. Also, taking graduate level courses in epidemiology and statistics was critical. Network was also advanced via the SHE PhD Academy / meeting. Delightful opportunity to meet candidates from around the world.

Openness to a collaborative supervisory team that included a local supervisor in my home country as well as two excellent Maastricht-based supervisors. Flexibility Great engagement from the supervisory team

Expert research supervision and career mentoring

I had great advisors who were experts in the field, very accessible. I am still in touch. It was stimulating to see the global reach of the SHE and interact with other scholars. The SHE culture promotes intrinsic motivation. You cross the threshold into becoming a true educational scientist. Opens the door to a new world.

My PhD was undertaken as my 'retirement project', something I had always wanted to do. I started it with the thought that I might fully retire upon completion. However, my supervisors have been so encouraging and the whole PhD experience was so positive that I applied for, and received, a grant at the end of the PhD and will continue to do research on my chosen topic. My supervisors also strongly encouraged me to share my work with societal stakeholders and as a result I am sitting on the board of an organization that can implement some of our findings into practice.

Through the sharing of my research with societal stakeholders, one national payer has implemented a quality measurement and reimbursement system based on the principles of this research. A provincial regulatory authority has also developed a quality measurement and reporting system based on these same principles.

12. What characteristics of the SHE PhD programme could be improved to stimulate your development as a scholar and your professional network?

Selected responses:

I think this I a great question, collaboration among the PhD researchers can be further enhanced to support the researches of the candidates and even lead to the creation of research ideas or theories that SHE can promote. It is largely individual effort- if SHE tries to nurture (or enrich?) the individual researches it can lead to new theories, so the impact is much greater and the PhD researchers would feel (more than they do at present) they "belong" to an institution, especially the external (Asian) PhD candidates.

[A]s a programme, the UM PhD programme can be more communicative, collaborative, with the alumni, so that I can feel that I am a part of an international network - because of the UM alumni, and not only because of my personal interest.

Would be nice to have more facilitation of a network among international candidates.

Promote additional interaction opportunity particularly to the external PhD students.

Alumni events and closer networking

During my PhD (2010-2014) there were very few opportunities for linkages with other PhD students, or even to meet the full team at SHE. I suspect this has already been improved, but it would have been beneficial.

Better linkages with other PhD candidates in addition to SHE Academy, mini-SHE Academy

I do wish they would offer some more short courses like the short qual course that is well done.

More attention by supervisors and others to your development as a person and the place where you could use your talents after the PhD project, inside but also outside(!!!!) the university.

Exit conversation Support planning future career Discussing job opportunities

Appendix 2f
SHE PhD Guide (February 2021)

1. Introduction

The SHE PhD guide aims to inform PhD candidates and their supervisors within SHE about our PhD policy. It offers information about the different phases of the PhD project, from start to end, focusing on relevant topics and practical matters to consider. Additionally, this guide contains an overview of relevant websites and contact persons.

The Graduate School of Health Professions Education (SHE)

The Graduate School of Health Professions Education (SHE) at the Faculty of Health, Medicine and Life Sciences (FHML) at Maastricht University is a graduate school for education and research in health professions education. SHE offers a wide range of courses in health professions education ranging from short courses to degree programs such as a Master and PhD program and includes a research program. SHE's research program 2018-2023 is entitled 'Task-Centered Learning Environments in the Health Professions'. The program has four main themes: (1) goals and values of and approaches to evaluation, (2) approaches to instruction**,** (3) approaches to assessment, and (4) approaches to implementation. The full description of the program can be found here. The SHE research program is led by the scientific director of SHE, Prof. Dr. Pim Teunissen.

2. The SHE PhD program

The SHE PhD program is an important part of the SHE research program. Educational research is essential for finding new and better ways to educate doctors, nurses, physical therapists and other health professionals. SHE offers a face-to-face and distance-based PhD program. The PhD candidates receive supervision from highly experienced and internationally acknowledged educational researchers associated with SHE. The general aim of the PhD program is to develop the next generation of health professions education researchers who can contribute to research and innovation in health professions education.

Objectives of the PhD program

The main objective of the PhD program is to enable participants to perform educational research (typically a series of empirical studies), resulting in a PhD thesis. A PhD thesis at SHE consists of at least four journal articles published in or submitted to peer-reviewed international journals reporting on the empirical work that was conducted. PhD supervisory teams strive to have at least two articles within the thesis published or accepted in international peer reviewed journals before the approval of the thesis. In addition, the PhD thesis includes an introductory chapter, a conclusion/discussion chapter, and a summary in English and Dutch. The aim of writing a PhD thesis is to learn to independently conduct high-quality educational research.

Below, the final achievement standards for a doctorate within SHE are described. These are adopted from the VSNU (Association of Universities in the Netherlands) Position Paper 'Hora est!' (2004) and from the NFU guidelines (Dutch Federation of University Medical Centers).

- The successful candidate has made an original contribution to academic research of a quality which stands up to peer review at the level common within and outside of the Netherlands;

- The successful candidate has demonstrated their ability to apply the academic methods used in the discipline concerned for developing, interpreting and putting into practice new knowledge;

- The successful candidate has acquired and worked with a substantial body of knowledge, which, at the very least, embraces the principles and methods of international academic practice and of theorization, methodology and study in the discipline concerned;

- The successful candidate possesses the ability to design and implement a substantial project for the purpose of developing new knowledge;

- The successful candidate is able to communicate knowledge and methods pertaining to their discipline or specialism in an effective way;

- The successful candidate communicates their research and its results through publications in internationally recognized, peer reviewed journals.

- The successful candidate is able to exercise social responsibility in conducting, applying and making use of their own research.

Types of PhD candidates

Four types of PhD candidates are distinguished within SHE:

1) full time internal PhD candidates;
2) part time internal PhD candidates;
3) international external PhD candidates;
4) Dutch external PhD candidates.

All types will defend their PhD thesis at Maastricht University. Table 1 provides more details about the differences between the types of PhD candidates.

Table 1: Types of PhD candidates within SHE

Type of PhD	Location	On UM payroll	Extent of PhD appointment	Supervision	Tuition fee	TRACK registration
Full time internal PhD	Maastricht University	Yes*	0.8 fte or more	Mostly face-to-face	N.A.	Employed as promovendus
Part time internal PhD	Maastricht University	Yes	0.4 fte or more and less than 0.8 fte	Mostly face-to-face	N.A.	Other UM/MUMC staff doing a PhD
International external PhD	International	No	N.A.	Mostly online	Fee paid	Contract PhD candidate
Dutch external PhD	Dutch universities/ institutions	No	N.A.	Mostly online	No fee paid	Contract PhD candidate

*An exception in this category are certain scholarship students, e.g. CSC scholarship students. They are not on the payroll of SHE, yet they are regarded as full time internal PhD candidates.

Team of supervisors

Minimally two and maximally three supervisors are involved in the PhD team. Commonly, one 'promotor' (full or associate professor with an appointment at SHE) and one 'co-promotor' (daily supervisor) are assigned to each PhD project. In the case of external PhD candidates, we advise to include an external supervisor from the candidate's institution or context (holding a PhD degree is a requirement). Together, the supervisors are responsible for monitoring and stimulating the progress and quality of the project. When a supervisory team for specific reasons wishes to include more than 3 members, approval from the Dean needs to be obtained. In the separate empirical studies that make up the PhD project, additional collaborators can be involved without approval from the Dean.

Duration of the PhD program

How much time it takes to write the thesis varies considerably. A full time PhD candidate on average needs four years to finish the PhD thesis (extension is possible in case of delay for reasons outside of the research such as pregnancy, maternal/paternal leave). Completion duration of part time and external PhDs greatly depends on the percentage of time available to spend on their PhD thesis, as well as prior research experience. It is important that at the start of each PhD project the starting and end date are carefully estimated and determined, taking into consideration prior research experience and percentage of time available to spend on the PhD thesis.

Size of the PhD program

Table 2. Number of SHE PhD candidates and supervisors per 01-02-2021

PhD candidates	95
Supervisors (including external supervisors)	108

3. Start of the PhD project

Development, submission and approval of PhD project proposal

Each PhD project is defined in a PhD project proposal in terms of starting date and expected completion date of the project, the studies to be conducted, the team of promotors/supervisors, the available budget and the planning of the studies. A template for the PhD project proposal, as well as more information about admission and application, can be found here. Many PhD candidates will prepare this proposal as part of the SHE course "Writing a PhD Research Proposal".

Once final, the proposal has to be submitted to SHE, through the Journal of SHE PhD Projects (JSHEPP). The PhD project proposal will be reviewed and must be approved by the SHE scientific director. The PhD project proposal of all full time internal PhD candidates must also be approved by the Interuniversity Centre for Educational Research (ICO, see further below).

In some cases, an internal prospective PhD candidate without approved PhD project proposal is appointed as PhD candidate. This will be done if (internal or external) funding is guaranteed and if the PhD candidate has been recruited through a selection procedure. In this case, the PhD candidate will write the PhD project proposal at the start of their project guided by the supervisors.

Letter of acceptance and other documents

Once the proposal has been approved by the SHE scientific director, external PhD candidates are asked to sign a Letter of Acceptance and Agreement that stipulates the conditions of the PhD program. By signing this letter, external PhD candidates also state that they are familiar with and will commit to the 2018 Netherlands Code of Conduct for Research Integrity, the SHE Data Management Policy, and the Maastricht University Regulations for Obtaining the Doctoral Degree.

Internal candidates will sign the Code of Conduct in their employment condition interview with HR, and will receive the SHE Data Management Policy and Maastricht University Regulations for Obtaining the Doctoral Degree from the PhD coordinator in a welcome meeting.

In addition, candidates are asked to submit a number of documents, e.g. certified copy of diploma and transcript, and for external candidates, a letter of approval of the candidates' involvement in the PhD program from the candidates' institution.

Registration at Maastricht University

All PhD candidates are registered at Maastricht University and will receive a Maastricht University user name, password, email account, and registration (SAP) number. This will also grant access to the online library of Maastricht University and other resources, courses and services.

Access to the SHE Research WIKI

In addition, PhD candidates will receive an account to access the SHE Research WIKI at the start of their project. This WIKI contains relevant information and documents related to starting, ongoing and completed SHE PhD projects, SHE meetings, grant possibilities and research resources. It includes up-to-date information on the SHE data management policy and open access publishing. Jeroen Donkers (jeroen.donkers@maastrichtuniversity.nl) manages the content of and access to the WIKI.

Registration as ICO PhD student

The Interuniversity Centre for Educational Sciences (ICO) is the Dutch research school accredited by the Royal Netherlands Academy of Arts and Science. All full time internal SHE PhD candidates are required to register as member of ICO. More information about the application procedure can be found on www.ico-education.nl.

As part of the ICO application procedure, the candidate's project proposal needs to be submitted to and approved by ICO. After approval, ICO PhD candidates need to fill out a training and supervision plan as used by ICO (ICO-OBP plan). Other SHE PhD candidates can also be involved in ICO if they meet ICO's requirements. SHE covers the ICO membership fees of all full time, internal PhD candidates. Other PhD candidates need to cover their fees independently. Pascal van Gerven (p.vangerven@maastrichtuniversity.nl) is the SHE contact person for ICO matters.

PhD budget, including budget for courses

The costs for internal PhD projects financed by other institutions than SHE (e.g. NWO) are paid for by the respective institutions. The same holds for external PhD projects; external PhD candidates are responsible for financing their participation in courses, conferences and other activities themselves.

Internal PhD candidates whose projects are financed by SHE need to submit further details about their budget to SHE. This includes budget for conferences, courses and other activities. They can use the

example excel sheets provided on the Research in Education WIKI (under 'Research Resources') when specifying their budgets. Two example sheets are provided: one for (mostly) quantitative research and one for (mostly) qualitative research. The internal PhD candidates' budget needs to be submitted to the SHE financial contact person, Joost von Weersch (joost.vonweersch@maastrichtuniversity.nl). The budget needs to be approved by the SHE Research management team as soon as possible after completing the PhD project proposal.

Determining the expected completion date

The default duration of a PhD project is 4 years. For fulltime internal candidates, this duration is fixed and aligns with the employment contract. For other candidates, the duration might differ. It is important for SHE to have an up to date overview of the expected completion dates of PhD projects.

Expected completion date = the date that the manuscript is ready to be sent to the assessment committee.

PhD candidates and supervisors are asked to discuss a realistic, feasible expected completion date within the team. The PhD candidate has to register this in TRACK (Field: Expected completion of PhD). Preferably, this is done before generating the Training and Supervision Plan (TSP) in TRACK (see below). The expected completion date is then automatically registered in the TSP when this is generated from TRACK.

Registration in TRACK

Progress of the PhD project is monitored by the PhD candidate and their team through an online program called TRACK. All PhD candidates receive a TRACK account at the start of their project and are asked to complete information about their projects. They are also asked to upload a Personal Research Plan (PRP) within 12 weeks after the starting date. TRACK provides a template for the PRP, but the approved PhD project proposal can be uploaded for this purpose as well. The PhD candidate will receive notifications and instructions from TRACK on where to upload the PRP/research proposal.

Email notifications are sent out to the PhD candidate and PhD team whenever action in TRACK is required. If you have any questions about the use of TRACK, contact Nicky Verleng (n.verleng@maastrichtuniversity.nl).

Training and Supervision Plan (TSP)

Candidates will also receive notifications and instructions from TRACK to complete a Training and Supervision Plan (TSP) and to discuss it with their team of supervisors within the first 12 weeks of their project. The TSP is intended to encourage a conversation between the candidate and the supervisors about the candidate's professional development, training needs, and teaching opportunities during the PhD trajectory, and a feasible expected completion date.

TRACK can generate the TSP form automatically based on the information that the candidate adds in TRACK, after which it can be discussed in the team. The TSP needs to be signed by the PhD candidate and the team of supervisors, after which it should be uploaded in TRACK, where the PhD coordinator of SHE will then check and approve the TSP on behalf of the Dean. For internal PhD candidates, the TSP needs to be forwarded to the HR office as well, and a member of the HR office will sign the document (the HR advisor for SHE is Irene Driessen: i.driessen@maastrichtuniversity.nl).

Moreover, within 12 weeks after starting the PhD project, the PhD team is asked to discuss how they would like to collaborate and communicate, through use of the PhD Team Tool. The PhD Team Tool can be found in TRACK under 'documents'.

Table 3. Overview of starting documents

	Internal		External	
Document	**Full time PhD**	**Part time PhD**	**International PhD**	**Dutch PhD**
PhD project proposal	yes	yes	yes	yes
Signed letter of acceptance	no	no	yes	yes
Approval letter from the candidate's institution	no	no	yes	yes
Training and supervision plan (TRACK)	yes	yes	yes	yes
Personal research plan (TRACK)	yes	yes	yes	yes
PhD Team Tool (TRACK)	yes	yes	yes	yes
Detailed budget to be submitted to SHE	yes	yes	no	no
ICO project proposal	yes	if ICO member	no	if ICO member
ICO training and supervision plan	yes	if ICO member	no	if ICO member

4. During the PhD project

Supervision

During all steps of the PhD project, supervision will be provided (e.g. feedback during the writing process, methodological advice on data analysis) by means of face-to-face meetings, or for external PhD candidates via email, Zoom, Skype, and other media.

Commonly, PhD candidates schedule a one-hour meeting with their team of supervisors approximately once every three to four weeks. Typically, the PhD candidate submits an agenda for the meeting and documents to be discussed. In addition, the PhD candidate commonly organizes more frequent meetings with the co-promotor (daily supervisor), e.g. once per one or two weeks, and/or drops in on their daily supervisor at any time for questions.

The hours specified for supervision hold for PhD candidates with a contract of at least 0.8 fte. PhD candidates who spend less time on their PhD receive a proportional number of hours for supervision per week. Furthermore, it is important to keep in mind that the numbers of hours of supervision per week might differ per phase of the PhD project and per specific needs of the candidate.

PhD coordinator and PhD representative

A PhD-coordinator is available for all PhD candidates involved in SHE. The SHE PhD coordinator (Janneke Frambach, j.frambach@maastrichtuniversity.nl) arranges a meeting with each internal PhD candidate at the start of the PhD project. The PhD coordinator informs all PhD candidates about the SHE PhD policy and procedures, PhD courses, supervision of PhD candidates, and other relevant aspects. The PhD coordinator can also be contacted by PhD candidates and PhD supervisors when problems are encountered within the PhD project.

The PhD coordinator is furthermore responsible for use of the monitoring system TRACK, and for organizing the PhD conference 'SHE Academy'. Finally, the PhD coordinator is responsible for PhD issues within the SHE Research management team, and she represents the interests of SHE PhD candidates and supervisors at Faculty and University level.

Next to the PhD coordinator, there's a PhD representative at SHE; one of the PhD candidates who represents the interests of SHE PhD candidates. The PhD representative (Lianne Loosveld, l.loosveld@maastrichtuniversity.nl) is a member of the SHE Research management team and the FHML PhD Committee. PhD candidates can contact Lianne with any questions related to their PhD experience.

Confidential PhD counsellors

A confidential PhD counsellor is available for PhD candidates within SHE. This is SHE staff member Herma Roebertsen (h.roebertsen@maastrichtuniversity.nl). PhD candidates can contact the confidential counsellor for all issues they would like to confidentially talk about. PhD candidates are recommended, if possible, to first discuss their concerns with their supervisors and to search within their team of supervisors for solutions if problems are experienced. However, if there are particular issues that they would prefer to talk about with an outsider or if they need advice on how to discuss a topic with their supervisors, there is always the possibility to contact the PhD confidential counsellor of SHE.

Furthermore, there is an independent external confidential advisor available for PhD students at FHML/MUMC+, prof. Frans Feron. PhD candidates experiencing problems that they prefer to discuss with a person who operates fully independent from SHE, can contact prof. Feron. During his 40-year career in healthcare, prof. Feron has gained a lot of experience in this field. He has worked as a youth healthcare physician, as a confidential doctor for child abuse and as a professor of social medicine at Maastricht University. He also served for years as an internal confidential counselor for PhD candidates at one of FHML's research schools. Prof. Feron can be contacted at f.feron@maastrichtuniversity.nl.

Scientific integrity

SHE considers scientific integrity as a core value of responsible research conduct. All PhD candidates sign the Netherlands Code of Conduct for Research Integrity upon the start of their project. In addition, PhD candidates and supervisors are encouraged to consult the FHML webpage of scientific integrity, where they can find the MUMC+ Research Code, which was developed in line with the Netherlands Code of Conduct for Research Integrity and the UM Integrity Code of Conduct.

The webpage furthermore contains a comprehensive overview of issues to consider regarding scientific integrity. It includes information on what to do and links to available websites/tools. The aim of this overview is not only to abide by the principles set out in the MUMC+ Research Code but also to engage in a broader dialogue about scientific integrity and good practice in research. The overview can be used for all involved in research, and has also been designed for use by supervisors and PhD candidates at the start of a PhD trajectory, for discussion throughout the project and during the annual assessments.

The webpage also provides contact info for the MUMC+ Platform Scientific Integrity, which has been installed to create a culture of awareness regarding scientific integrity. The SHE representative (and chair) of this platform is Karen Könings (kd.konings@maastrichtuniversity.nl).

Research ethics and data management

In addition to complying with the Netherlands Code of Conduct for Research Integrity, ethical approval is needed for all research projects carried out within SHE. Researchers will typically need ethical approval from their own university or hospital. For SHE researchers located in the Netherlands, ethical approval can be asked from the Netherlands Association for Medical Education (NVMO; website in Dutch). The SHE contact person for research ethics is Karen Könings (kd.konings@maastrichtuniversity.nl).

With regard to European regulations for privacy (GDPR) and national policy concerning research data, PhD candidates must follow the SHE policy for research data management. This policy has implications for the storing, sharing and transferring of research data. Detailed information about this policy, including a template for the data management plan, can be found on the SHE Research WIKI. For each separate study of the project, a data management plan needs to be developed.

The SHE data manager is Jeroen Donkers. Contact shedata@maastrichtuniversity.nl for any questions on research data management.

Open access publishing

Maastricht University encourages open access publication of research, in accordance with national policy. More info about open access can be found on this UM Library page on Open Access. Maastricht University has agreements with many scientific publishers, allowing Maastricht University researchers and PhD candidates (internal and external) to publish open access free of charge. PhD candidates can check whether an agreement exists with a journal/publisher that they want to publish in, meaning that no fee needs to be paid. Select a journal from the following list: open access journals free for UM. Many major journals in our area are on this list: Medical Education, Medical Teacher, and so on. For some journals it is stated in the list that the agreement status is unknown (e.g. for Academic Medicine). In that case, always contact the library to ask about the possibilities. In the case of Academic Medicine, for example, the library can provide a voucher code for free open access publication. This is the library email address to contact with all questions about open access: ub-ayl-e@maastrichtuniversity.nl.

In case costs are charged for open access publication, PhD candidates need to cover these from their individual research budgets. More information about the SHE open access policy can be found on the SHE Research WIKI (under 'Research Resources').

Wellbeing and progress: Progress meeting and TRACK annual questionnaire

PhD candidates and supervisors are strongly encouraged to discuss and evaluate the progress of the project, wellbeing of the PhD candidate, and team collaboration at a regular basis during their team meetings. It is advised to furthermore schedule a progress meeting once a year to discuss these topics in more depth, including the quality of the supervision; PhD training courses that were done or still need to be done; teaching activities; career development plans; problems encountered and agreements for improvement. The annual questionnaire sent to the candidate through TRACK can be used as input for this meeting.

Once a year, TRACK sends out a questionnaire to the PhD candidate to evaluate progress, supervision and wellbeing. The questionnaire is confidential; the PhD coordinator is the only one with access to the answers. PhD candidates are suggested to use this annual moment to place these themes on the agenda of one of their team meetings. They might use (part of) their answers to the questionnaire as input for this meeting; only if they feel comfortable to share this with the team.

The PhD coordinator monitors the questionnaires to maintain quality of the PhD program. If the responses suggest that further action is needed, the PhD coordinator will first contact the PhD candidate in question to discuss this. When deemed necessary, a meeting might be organized between the PhD candidate and supervisors to discuss solutions. It is also possible to consult the PhD coordinator or confidential PhD counsellor (see above).

Once a year, ICO PhD candidates are asked to fill out the ICO monitor. In other words, all full time internal SHE PhD candidates are also monitored by the national research school ICO.

TRACK evaluation periods

Every six months, supervisors are asked to record the PhD project progress in TRACK. This is an evaluation of the project progress for which the team as a whole is responsible. It is not an individual evaluation of the PhD candidate.

Supervisors are asked to record three aspects:

1. Qualification

Green: Good - *The project is progressing according to the project schedule. There might be a small delay (e.g. 1-6 months), but it is still feasible to catch up during the remainder of the project or to complete the project with minor delay.*

Orange: Attention - *The project is progressing, but is substantially behind schedule (more than 6 months). It is unclear or unlikely that the project can be completed before the originally planned end date. The project schedule has to be revised. (see below how to revise the expected completion date)*

Red: Insufficient - *The project is not progressing. It is highly unlikely that the project will be completed before the originally planned end date. The project schedule has to be revised. (see below how to revise the expected completion date). A decision has to be taken about continuing or discontinuing the project.*

2. Reason

Supervisors are asked to describe the reason(s) for the qualification, which provides relevant info to SHE and can be regarded as more important than the actual qualification.

3. Progress

Supervisors indicate the numbers of months that the project is behind or ahead of planning to achieve the planned end date.

Adapting the expected completion date of a PhD project

The default duration of a PhD project is 4 years. For fulltime internal candidates, this duration is fixed and aligns with the employment contract. For other candidates, the duration might differ. It is important for SHE to have an up to date overview of the expected completion dates of PhD projects.

At minimum once a year, the feasibility of the expected completion date should be discussed within the team (e.g. during the annual progress meeting, see above). In case the date needs to be adapted, the candidate changes the date in TRACK (Field: Expected completion of PhD). Note that changes of the expected completion date have to be discussed with and approved by the team as a whole.

Expected completion date = the date that the manuscript is ready to be sent to the assessment committee.

For international external PhD candidates: Possibilities to put the PhD project "on hold"

In case of personal or other circumstances that inhibit a PhD candidate to work on their project for a certain period of time, there is a possibility to temporarily place the project "on hold". For the duration of the project as a whole, the project can be placed on hold for a maximum of three times, with each on hold period lasting six months. These periods can be consecutive or intermittent. During these period(s), no tuition fee is required.

In addition, the following conditions apply:

- The decision to place the project on hold is taken jointly with alle members of the team (PhD candidate and supervisors).
- The PhD candidate informs the PhD coordinator, who has to approve the "on hold" status. Consequently, the PhD secretariat is informed.
- During the on hold period, there is no guidance and supervision with regard to the project.
- Placing the project on hold can only be done prospectively, not retroactively.
- When resuming the project after the on hold period, the PhD coordinator is informed, and, if necessary, a new expected completion date will be determined (see above).

NB. In exceptional situations, the PhD coordinator can be consulted to discuss if an individual arrangement is necessary.

For internal PhD candidates: Evaluation meeting / assessment interview

For internal PhD candidates who are employed within the Department of Educational Development and Research or other departments of Maastricht University, it is the responsibility of the chair of the department to schedule an annual evaluation meeting. In addition to the PhD supervisors, it can be decided to invite another staff member who might be better informed about the non-PhD related activities of the candidate to the meeting. During the interview a review form provided by the HRM office of FHML is used for PhD candidates who are employed at Maastricht University.

For full time internal PhD candidates, at the end of the first year, a formal assessment interview will take place. An HR representative is present at this meeting as well. The promotor must give an advice to either continue or stop participation of the candidate in the PhD program. The final go/no-go decision after year 1 will be taken by the scientific director of SHE. The requirement for acceptable progress is one completed manuscript (ready for submission to a journal) per year. A signed copy of the first year assessment interview report is sent to HR.

For internal PhD candidates: Teaching opportunities

Full time internal PhD candidates are expected and encouraged to fulfill educational roles at Maastricht University, such as tutor, block planning group member, skills teacher, etc. at 10% of their appointment. Part time internal PhD candidates may fulfill educational roles as agreed in their appointment. Once a year, usually in April/May, acquisition for the fulfillment of the different educational roles within the Department of Educational Development and Research takes place. All starting internal PhD candidates at this department are asked to schedule a meeting with the education coordinator of the Department of Educational Development and Research, Ineke

Wolfhagen (i.wolfhagen@maastrichtuniversity.nl), to discuss their teaching ambitions and which educational roles might fit their interests and expertise.

Internal candidates are also encouraged to register for teaching faculty development courses, such as tutor training, University Teaching Qualification course, and others.

Personal, professional and career development

Supervisors are encouraged to discuss personal, professional and career development at regular intervals with their PhD candidates during the PhD project, and to advise on relevant courses and other activities. Internal PhD candidates can make use of PhD career management and mental wellbeing courses offered by the Maastricht University Staff Career Centre. This centre also offers individual career guidance and personal coaching. More information can be found here. PhD candidates are encouraged to discuss their career plans and wishes with their supervisors.

PhD courses

PhD courses offered by Maastricht University

Relevant PhD courses are offered for all PhD candidates at FHML. Many of these FHML courses are free of charge for internal and external SHE PhD candidates. Many of these courses are face-to-face, however, the online course offer is growing. For example, there are online introductory courses in statistics, qualitative research and academic writing. The University Library also offers a range of courses free of charge for PhD students, such as introduction to research data management, introductory and advanced courses in EndNote, increasing your research impact, etc. The FHML and library course offer can be found here. PhD candidates need their UM registration number (p-number) to register for most of these courses (see above: "Registration at Maastricht University").

For internal PhD candidates, the Maastricht University Staff Career Centre offers a range of courses that are particularly aimed at PhD candidates, such as time management, self management and career management. A small fee is asked for these courses. More information can be found here. SHE offers several courses at PhD level. Fees for these courses have to be covered from the candidate's individual budgets. More information can be found here.

PhD courses offered by ICO

The Interuniversity Centre for Educational Research (ICO) also organizes PhD courses. In order to receive their ICO certificate, all ICO PhD candidates are required to participate in the following ICO modules: ICO introductory course (5 Education Credits (EC)), two thematic ICO master classes (each 3 EC), one methodological ICO master class (3 EC), ICO's National Spring School (1 EC) and ICO's International Spring School (3 EC). Thus, ICO PhD candidates attend about 500 hours in the ICO educational program (18 EC). Participation is free of charge for ICO members. For non-ICO members, participation costs € 1000 per course. The training courses mainly take place in Utrecht in the Netherlands and are spread over a period of several weeks. More information is available at the ICO website (www.ico-education.nl).

Methodological and language support

PhD candidates who struggle with academic writing and/or English language, may send the final draft manuscripts of their studies to the SHE language editor, Angelique van den Heuvel (ajm.vandenheuvel@maastrichtuniversity.nl), who can perform a language revision before submission to a journal. Drafts submitted to Angelique have to comply with the formal requirements of the

journal they will be submitted to (maximum number of words, structure/headings etc.). Non-Dutch speaking PhD students who wish to have their PhD dissertation summary translated into Dutch can also contact Angelique.

PhD candidates who struggle with quantitative methodology and statistics can contact Jeroen Donkers at j.donkers@maastrichtuniversity.nl. Based on topic, expected methods, and availability of the PhD candidate and consultants, the PhD candidate will then be assigned to one of the quantitative research consultants at SHE.

PhD candidates who struggle with qualitative methodology can contact one of the SHE qualitative research consultants: Dr. Janneke Frambach (j.frambach@maastrichtuniversity.nl) and Dr. Renée Stalmeijer (r.stalmeijer@maastrichtuniversity.nl).

SHE activities and events

SHE presents new candidates

Recently started PhD candidates present themselves and their proposal in one of the 'SHE-presents new candidates' meetings. These are organized twice a year.

SIG presents

SHE has a number of Special Interest Groups (SIG), i.e. groups of junior and senior researchers who have organized themselves around a certain area of interest. Currently, SHE has five SIG's:

- Educational Change and Co-Creation
- Globalization, Internationalization and Diversity
- Interprofessional Education and Collaboration
- Instructional Design and Self-Regulated Learning
- Workplace-Based Learning

More information and contact persons for each SIG can be found on the SHE Research WIKI. It is encouraged that SHE PhD candidates participate in one (or more) SIG's. Most SIG's hold regular (online) meetings with their group. Once a year, each SIG organizes a 'SIG presents' meeting that can be attended by other SHE researchers and PhD candidates.

SHE Journal Club

SHE organizes a number of journal club meetings per year during which relevant literature is discussed between SHE researchers. The meetings last one hour and take place at Maastricht University. Online presence is facilitated. During each meeting one paper is discussed. This paper typically is a state-of-the-art paper that is selected by a staff member or the organizing team. The discussion is organized around the reading questions that are formulated by the staff member or the PhD candidate who has put forward the paper.

SHE Academy

Biannually (every odd-numbered year) the PhD conference 'SHE Academy' is organized in Maastricht (or online in times of pandemic). The goal of this meeting is community building and exchange of ideas among SHE researchers and PhD candidates, for both internal and external PhD candidates. PhD candidates are strongly encouraged to attend at least one SHE Academy meeting during their PhD project.

In the year following on SHE Academy, a mini version of SHE Academy is organized (Mini SHE Academy), usually taking place at the AMEE conference.

Relevant conferences

PhD candidates are encouraged to present their work at national and international conferences. Interesting Dutch conferences are: Onderwijsresearchdagen (ORD, organized by the Dutch Association for Educational Research/VOR) and the NVMO conference (organized by Dutch Association for Medical Education). Interesting international conferences are: AERA (American Educational Research Association), EARLI (European Association for Research on Learning and Instruction), and AMEE (Association for Medical Education in Europe). Naturally there are many more. At the annual AMEE conference, SHE organizes a social gathering for all SHE students, staff, alumni and SHE partners.

Relevant professional associations

The following professional associations might be of relevance for SHE PhD candidates. Two Dutch associations are of interest: NVMO (Dutch Association for Medical Education) and VOR (Dutch Association for Educational Research). The Department of Educational Development and Research has a collective membership of NVMO, due to which all PhD candidates are automatically member of this association. The NVMO also has a network for PhD candidates and organizes a meeting once a year for PhD candidates and supervisors. See www.nvmo.nl. The VOR is the Dutch association for educational research. The VOR also has a network for PhD candidates, entitled VPO (VOR PhD consultation). They also organize a meeting for their PhD candidates once a year www.vorsite.nl.

At the international level the following associations might be of relevance: AERA, EARLI and AMEE. The AERA is the American Educational Research Association. PhD candidates of SHE do not need to subscribe as a member, because promotors within SHE are members, due to which PhD candidates can subscribe to the AREA meetings. www.aera.net. The EARLI is the European Association for Research on Learning and Instruction. This association also has a network for Junior Researchers (JURE) that is of interest to junior researchers and PhD candidates. They organize pre-conferences for junior researchers before the EARLI conference (once in two years) that can be attended by PhD candidates. www.earli.org. Furthermore, conferences on specific topics are organized by special interest groups within EARLI. The AMEE is the Association for Medical Education in Europe and also organizes a conference once a year. www.amee.org.

SHE Scholarships

SHE offers a number of scholarships to financially support students and researchers who would like to participate in SHE's educational or PhD program. Below, an overview is provided of the types of scholarships, eligibility criteria, and their deadlines. You can find all details of the Scholarship program here.

Table 4. Overview of SHE Scholarships

Deadline	Scholarship	Eligibility
July 1	Course: Writing a PhD research proposal	SHE MHPE graduates who completed the Research Track
	Material research costs	SHE PhD candidates from developing countries
December 1	Course: Writing a PhD research proposal	SHE MHPE graduates who completed the Research Track
	Coursework at PhD level	International SHE PhD candidates
	Bi-annual SHE Academy	SHE PhD candidates from developing countries

5. End of the PhD project

Final steps of the PhD process within SHE

When the separate studies of the PhD project have been completed, PhD candidates can start writing the final two parts of their PhD thesis, being the introduction chapter and the discussion chapter. Supervisors can provide several examples of SHE PhD dissertations. When finalizing these chapters, the steps below should be started. Keep in mind that the entire approval procedure, starting with submission of the thesis to the assessment committee and ending with the PhD defense ceremony, can take up to 5 months. An important step is to be aware of and read the UM regulations for obtaining the doctoral degree! Available here.

The promotor should inform Nicky Verleng (n.verleng@maastrichtuniversity.nl) approximately one month before the manuscript is ready for submission to start up the necessary administrative procedures.

Make sure your research data are stored in Dataverse

After you published a study, but in any case before you defend the PhD thesis, your anonymized data needs to be made available on the Dataverse platform (www.dataverse.nl). See the SHE Research WIKI for more information about data management and Dataverse, or contact the SHE data manager at shedata@maastrichtuniversity.nl.

Discuss the members of the assessment committee

Discuss with your team of promotors (supervisors) which assessors could be involved in the assessment committee. When your team of promotors perceive the PhD thesis to be of sufficient quality, it will be presented to the assessment committee. The committee consists of at least four and no more than five members: two or three from Maastricht University (internal reviewers; one of them is the chair of the committee), two external members, and the majority should be full professor. This is detailed in the Maastricht University promotion regulations, which are available on the UM webpage for PhD support. The promotor approaches and invites the assessment committee members.

Write impact paragraph

The impact paragraph is a reflection of 500 to 2000 words, in layman's terms (for a wide target group), on the scientific impact of the results of the research described in the thesis, as well as, if applicable, the social impact anticipated or already achieved. More information about the impact paragraph can be found in the promotion regulations (available here).

Four questions are provided that can serve as a guideline for drafting the impact paragraph:

1. (Research) What is the main objective of the research described in the thesis and what are the most important results and conclusions?
2. (Relevance) What is the (potential) contribution of the results from this research to science, and, if applicable, to social sectors and social challenges?
3. (Target group) To whom are the research results interesting and/or relevant? And why?
4. (Activity) In what way can these target groups be involved in and informed about the research results, so that the knowledge gained can be used in the future?

Edit or layout your thesis

Before the PhD thesis can be sent to the assessment committee, it should be edited. The layout of the document sent to the assessment committee preferably does not differ from the layout of the final thesis. Have a look at thesis examples provided by your supervisor to see examples of layout and see

page 21 for further details. PhD candidates can layout the thesis themselves or they can ask an official publisher for help; such as Ipskamp Printing, Gildeprint or Proefschriftmaken.nl.

Send manuscript to the assessment committee

The version for the assessment committee should contain at least:

- title page;
- names of supervisors and assessment committee members;
- table of contents;
- introductory chapter;
- chapters reporting the studies;
- discussion chapter;
- impact paragraph;
- English summary.

Once the team of supervisors approves this version, the promotor will send the manuscript to Nicky Verleng, who will share it with the assessment committee members.

The assessment committee will assess the quality of the thesis and will decide whether the thesis is of sufficient quality to be defended at Maastricht University. The committee will need at least four weeks to give their judgment. The committee will only approve (or, in very exceptional circumstances, reject) your thesis. They will typically provide no suggestions for further improvement of the thesis.

Finalize your thesis

Meanwhile, you can work on finalizing additional elements of the thesis. The final version should in addition contain:

- Formal information page about the defense ceremony (page 3 of the thesis). Before the thesis can be printed, this page must be officially approved by the PhD office. The same holds for page 4, on which the names of the team of promotors and the assessment committee are included. See page 21 of this guide for further instructions. Send page 3 and 4 of your thesis to Nicky Verleng for approval!
- Dutch summary. Non-Dutch-speaking candidates can contact the SHE language editor to translate their English summary into Dutch.
- Brief Curriculum Vitae of the author
- Acknowledgements
- SHE dissertation series. Contact Nicky Verleng for the most recent SHE dissertation series.
- (for ICO PhD candidates only) ICO dissertation series. These can be found on the ICO website.
- In addition, the thesis should contain a separate leaflet that includes 8-11 propositions (see below for proposition requirements).
- The thesis may contain a separate invitation to the public defense ceremony.

Write propositions or statements

A minimum of 8 and a maximum of 11 propositions or statements should be added to your thesis. Four propositions must be related to the subject of the dissertation. Three propositions must be related to the candidate's discipline, with the exception of the subject of the thesis. One proposition must be related to the impact of the results of the research for science and/or society. Any other propositions do not have to be related to the subject or the discipline. Make a longer list, so your team of promotors can indicate which propositions they prefer. Your team of promotors must approve the final list of propositions. Start in time with thinking about your propositions; preferably collect them during the course of your project. During the defense, questions can be asked about your propositions. You should be able to defend them.

Prepare printing of PhD thesis after approval

After the thesis has been approved by the assessment committee, and page 3 and 4 have been approved by the PhD office, you can continue with further preparing the printing of the thesis. Check and re-check layout and tables etc. before you print the thesis. A printed version of the PhD thesis should be sent to the assessment committee members at least one month before the defense. The number of PhD theses to be sent to the SHE secretary is about 20, which includes 6 copies for the Deans' office. It is up to you to order any amount of theses to be printed on top of the ones for SHE and the assessment committee. Typically, your team of supervisors, collaborators, close colleagues and family receive a copy. Nowadays it is common to send a digital version to other colleagues and researchers who request a copy.

The costs for layout and printing the PhD thesis are to be paid by the PhD candidate, except for PhD candidates who are employed at SHE if they have specified in their budget a maximum amount of 1000 euros for printing costs of the PhD thesis. However, part of the printing (and reception) costs may be claimed to Maastricht University. A claim form can be submitted.

Requests from University Library and UM press office

You will be asked to send a digital version of your dissertation to the University Library before the PhD defense. You have to submit a Statement of Approval, signed by your promotor, in order for the thesis to be accessible worldwide. More information will be sent to you by the UM PhD office and the library. Also, you will be asked to perform a voluntary plagiarism check for your thesis. Furthermore, you will be asked to provide your dissertation title and a short description of the dissertation to the UM press office.

Schedule the defense ceremony and reception

As a final step, the thesis has to be presented and publicly defended in a one-hour session. This ceremony has to be scheduled in advance. It is only allowed to make a reservation for the day of the defense at Maastricht University after the assessment committee has approved the PhD thesis. Exceptions can be made considering special circumstances. The date reservation is made by the secretary of SHE after the PhD candidate has been consulted about a possible date and the secretary has checked which date is appropriate for the team of promotors and if possible the assessment committee members. The assessment committee members will not be paid any fees or travel costs to participate in the PhD ceremony by SHE. If travel of an external member needs to be covered, the PhD candidate must find financial resources themselves. If certain committee members cannot attend the defense ceremony, additional examiners have to be found. This has to be discussed with the team of supervisors at least one month prior to the defense. The promotor will invite the examiners.

The thesis will be publicly defended in a one-hour session in which members of the assessment committee and possibly additional examiners question the candidate on various aspects of the research. The defense is an open ceremony and may be attended by relatives, friends and colleagues of the candidate. The PhD degree from Maastricht University is awarded after the ceremony. The defense will take place at Minderbroedersberg 4-6, Maastricht (in the city centre), or, only in times of pandemic, online.

After the (onsite) defense, the PhD candidate is required to organize a (small) reception to shake hands. You can choose to organize this onsite at Minderbroedersberg or at another location. The PhD candidate will receive an email with information about the possibilities to organize this onsite. There is a possibility to claim the costs of the reception to Maastricht University, using the PhD ceremony allowance. More details can be found here.

Prepare a presentation and discussion for the defense

Prepare a (powerpoint) presentation to be presented during the defense for max. 15 minutes. This time limit is strict! The powerpoint should summarize your thesis and is meant to inform the (lay) audience. Ask your peers and team of promotors for feedback on the presentation. In order to prepare well for the defense, start thinking about possible questions that could be asked by the assessment committee members and think about your answers. You could also arrange a session with some colleagues in which you present your powerpoint and defend the questions raised by your colleagues (i.e. mock defense). You could for example divide the chapters among your colleagues and ask each colleague to prepare one question, and ask them for feedback on your answers.

Select "Paranimfs"

During the defense two persons will support the candidate. They are called "paranimfs". They will sit next to the PhD candidate during the defense and have no further role. They could be asked to read aloud one of the propositions during the defense. The PhD candidate can choose these persons; it could be relatives, friends or colleagues. In online defense ceremonies there are no paranimfs.

Check the powerpoint for the defense

A few days before the defense, the PhD candidate can check the powerpoint in the building where the defense will take place, Minderbroedersberg 4-6. An email will be sent to the PhD candidate to make an appointment. In case of an online defense, instructions about the ceremony will be shared with the candidate well in advance.

SHE Dissertation Award

About 10 PhD candidates defend their thesis at SHE each year. Many of the theses are of very high scientific quality. To honor our PhD candidates and to celebrate scientific progress in health professions education, SHE offers an annual SHE Dissertation Award for the best PhD thesis defended in a particular year. The winner is announced at the SHE social gathering at the annual AMEE conference.

SHE Alumni Community

When you've successfully defended your thesis you will become part of the SHE alumni community. The SHE alumni community facilitates activities for and by SHE alumni. This community provides a sounding board for professionals who share the same interests. It aims to contribute to a continuation of the collaborative learning that took place during the SHE education programmes.

SHE alumni members all have either a Master in Health Professions Education (MHPE) degree or a PhD degree from the School of Health Professions Education and share the advantages of being part of the SHE Community network. SHE alumni constitute a worldwide bridge between the graduate school and society, making them our best ambassadors. They continue to be part of the academic community and provide a strong link to the health professions education community and societal institutes.
As a SHE alumni you:

- Continue to be part of the scholarly community—an important and useful network—and can rely on a bond of collegiality and friendship in which both the School of Health Professions Education and alumni actively participate;
- Have access to participation in special alumni activities;
- Exchange knowledge in health professions education and collaborate in projects;
- Receive regular updates on educational and research developments within SHE;
- Above all: enjoy staying in touch with former classmates, returning to Maastricht once in a while, reminiscing together and forging new friendships.

Guidelines for thesis layout

In order to promote the School of Health Professions Education (SHE) dissertations, PhD candidates within SHE are requested to use the following structure for first and last pages of their thesis.

Page 1:
Title thesis

Page 2:
The research reported here was carried out at

in the School of Health Professions Education

in the context of the research school (if applicable)

(Interuniversity Center for Educational Research)

and was funded by (if applicable)

(or other funding agencies)

ISBN
Copyright info
Cover design and printing info

Page 3:
Information about the public defense ceremony, see example thesis (this can be in Dutch or English)

Page 4:
Name(s) of the promotor(s)
Name(s) of the co-promotor(s)
Names of the assessment committee members, starting with the chair and then in alphabetical order. The affiliated institution is only mentioned for those who are not affiliated with Maastricht University.

Second-to-last page:
SHE dissertation series, check the most recent version with the secretariat of SHE.

Last page (only for ICO PhD candidates):
ICO dissertation series (download at www.ico-education.nl)

6. Overviews of contact persons and useful websites

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USEFUL WEBSITES	
SHE website. Contains info about the SHE research program, the PhD program, SHE courses, SHE scholarships, SHE community and more.	https://she.mumc.maastrichtuniversity.nl/
Maastricht University website for PhD support and PhD regulations. This page contains relevant practical information as well as the UM PhD regulations.	https://www.maastrichtuniversity.nl/support/phds
PhD courses offered by the Faculty of Health, Medicine and Life Sciences. Also contains links to relevant other courses, e.g. by the University Library, the Staff Career Centre, and external parties.	https://www.maastrichtuniversity.nl/about-um/faculties/health-medicine-and-life-sciences/phd-fhmlmumc/phd-training-programmes-fhmlmumc
SHE TRACK. Online monitoring system for PhD projects.	https://she.track.maastrichtuniversity.nl/Public/login
SHE Research WIKI. Contains relevant information for SHE researchers and PhD candidates, for example on data management, research ethics, special interest groups and more.	https://www.elearningfhml.nl/ovowiki/doku.php
JSHEPP. The submission website for SHE PhD project proposals.	http://www.epress.ac.uk/jshepp/webforms/author.php.
ICO website. Dutch Interuniversity Centre for Educational Sciences (national research school of which full time internal PhD candidates are member)	www.ico-education.nl
Maastricht University Library page on open access publishing.	https://library.maastrichtuniversity.nl/open-access/
PhD ceremony allowance page. Here you can find the Regulations for printing and reception costs for PhD's at Maastricht University, including a claim for to claim part of the printing and reception costs.	https://www.maastrichtuniversity.nl/support/um-employees/you-and-your-work/legislation/phd-ceremony-allowance
Editing and printing your thesis option	https://www.gildeprint.nl/en/printing-thesis/?noredirect=en-US
Editing and printing your thesis option	https://proefschriften.net/en/?utm_source=ips&utm_medium=website&utm_campaign=proefschrift_thesis
Editing and printing your thesis option	https://www.proefschriftmaken.nl/en/
Application procedure for ethical approval at the Netherlands Association for Medical Education (NVMO; website in Dutch)	https://www.nvmo.nl/index.php?page=Intro_erb&sid=2&are_cookies_accepted=11;CKI;20210208102554;137.120.160.131;4395c0600d24f34f5a1b65991a713637
FHML webpage on Scientific Integrity, which contains the MUMC+ Research Code and a comprehensive overview of issues to consider for PhD candidates and supervisors.	https://www.maastrichtuniversity.nl/about-um/faculties/health-medicine-and-life-sciences/scientific-integrity

Appendix 2g

Research programme 'Task-centered learning environments in the health professions'

Summary

Task-Centered Learning Environments in the Health Professions

The School of Health Professions Education (SHE) is a graduate school for research, education and innovation in the health professions education domain. Research on education is crucial to increase our understanding about how to optimally educate health professionals in order to prepare them for the delivery of high-quality care within the dynamic context of the healthcare setting and to support innovations in education. Current instructional design approaches emphasize the importance of using task-centered learning environments within training programs, in which learners either work on professional tasks in the clinical workplace or on learning tasks based on professional problems in the educational institute.

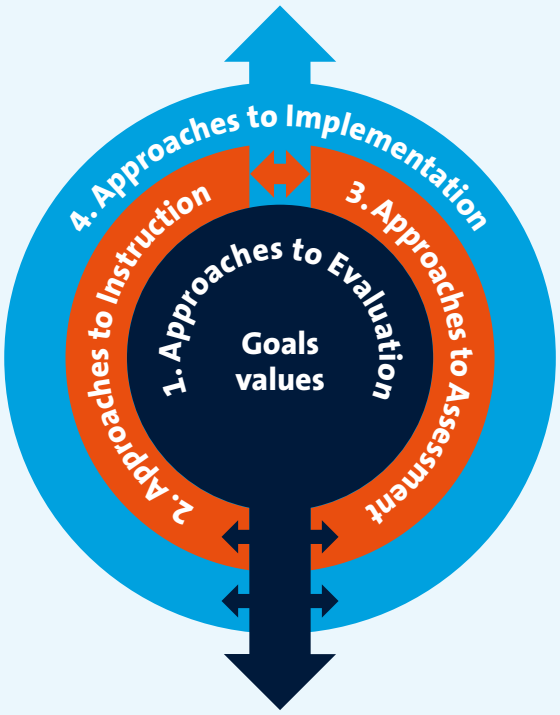
Task-centered learning environments better prepare learners for their future profession because these environments connect learning inside the educational institute to relevant professional situations outside the educational institute, often by integrating on-the-job and off-the-job learning. Within these environments, instruction and assessment are constructively aligned; that is, the learning tasks that learners work on provide information not only on learning, but also for feedback and assessment. The healthcare setting offers a unique and dynamic context for doing research on task-centered learning environments. Societal and technological developments are changing the role of the patient and the physician and bring new challenges to which the healthcare environment should adapt. In order to teach healthcare professionals to adapt to these new challenges in the workplace, it is key that their learning is situated in high-quality learning environments. Researchers in SHE conduct research on task-centered learning environments related to four main themes, specifically approaches to: (1) evaluation, (2) instruction, (3) assessment, and (4) implementation. The research is aimed at gaining a better understanding about which approaches work best for whom to reach specific goals or outcomes, under particular conditions.

Researchers in SHE conduct research on task-centered learning environments related to four main themes

Questions being addressed include: How and under which conditions do approaches to evaluation promote or inhibit improvement of educational practice? How to involve and engage students, teachers, and other stakeholders as partners in evaluation approaches? To what extent do training programs support the implementation of innovations in healthcare? How to ensure that learners receive neither too much nor too little guidance? How to integrate domain-specific and generic competency acquisition? How can new technologies optimize learning? How to develop an assessment and feedback culture that enhances learning and high-stakes assessment for accountability purposes? How to interpret qualitative assessment data? How to take perceptions of all stakeholders into account in the implementation of educational innovations? How to take institutional, educational, and cultural values into account when implementing educational innovations worldwide? The research focuses on refining theoretical insights as well as on applying these theoretical insights in practice. It uses various methods that may help to answer relevant questions, ranging from qualitative and quantitative studies, through mixed-methods studies, to experimental studies and design-based research projects. We aspire to conduct high-quality research with the ultimate goal of providing a stepping stone to the improvement of health professions education worldwide, thereby helping raise the quality of healthcare.

Introduction

In task-centered learning environments, it is real-world problems or tasks that drive learning (Francom, 2017). In a professional, clinical setting the driving force for learning will typically be the professional tasks and situations learners encounter (Teunissen, 2015). In an educational setting, it may be problems (problem-based learning; Dolmans & Gijbels, 2013), projects (project-based learning), or other types of learning tasks based on real-life tasks (van Merriënboer & Kirschner, 2018). Task-centered learning environments aim to better connect learning inside the educational institute to relevant professional situations outside the educational institute, often by integrating on-the-job and off-the-job learning. In this endeavor, one major challenge is to adequately balance the efficiency of adequate learner support and guidance with the effectiveness of centering learning on real-world learning tasks. The main aim of the SHE research program is to describe and analyze task-centered learning environments in the health professions; to investigate approaches to evaluation, instruction, and assessment in these environments; and to develop evidence-informed approaches to implementation in order to optimize task-centered learning environments.



Research themes SHE

The figure presents a schematic outline of the research program. The outer area indicates that healthcare is the context in which the vast majority of research takes place. Although the research program covers a variety of research topics on education, it mainly differs from other research programs on education in its strong focus on the health professions. The inner circle represents research on the *goals, values, and approaches to the evaluation* of learning environments in the health professions. The middle circle concerns research on approaches to instruction and assessment. These approaches aim to reach the goals and values specified in the inner circle, while carefully taking the contextual factors of healthcare in general and local settings in particular into account. Preferably, approaches to instruction and assessment are well aligned so that they are mutually reinforcing (Fastré et al., 2013). In a task-centered learning environment, it may happen that tasks are used for both instruction and assessment, even though assessment tasks often serve summative purposes. Indeed, in practice it may save time and effort to regard instruction and assessment as a single entity, however, from a research perspective, it is useful to make a distinction between approaches to instruction and assessment because it likely yields a more complete picture. The outer circle deals with research on the implementation of the approaches to evaluation, instruction, and assessment[1]. The next sections will first describe healthcare as the context of the research program, and then discuss each of the circles in more detail.

Healthcare as a unique research context

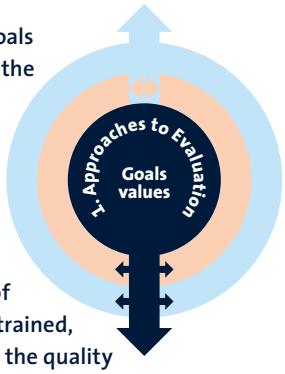
The healthcare setting offers a unique and dynamic context for doing research on task-centered learning environments.

First, societal developments are changing the role of the patient. Patients are nowadays better equipped and take an active instead of a passive role. The focus of interest has shifted to achieving value for patients in healthcare. The narrow focus on diagnosis and treatment is gradually extended to also include the person behind the disease, or the patient's social environment and psychological and spiritual well-being. There is also an increased interest in involving patients in shared medical decision-making. Other societal developments bring new challenges as well, such as an aging patient population going hand in hand with multimorbidity, requiring teamwork and interdisciplinary collaboration among various professionals. These societal changes bring new challenges within patient care, research, and training (Maastricht UMC+, 2015).

Second, technological advances will bring changes in healthcare. Such advances include new medical devices, robotics, telemedicine, big data and deep-learning applications, and many more. As a result, health problems will be detected earlier, new devices will become available and accessible for patients, media other than face-to-face meetings will be used in physician-patient communication, and so forth. Healthcare providers must keep up to date with all the new technological developments in their field and they must be able to support their patients in using these new technologies (i.e., care technology).

Third, societal developments will entail changes to the role of the physician. Physicians are no longer authorities but have to closely collaborate with patients and work toward creating partnerships with patients. Good healthcare should be provided in a physically and psychologically healthy work environment. The environment and the way it is organized and managed should help fulfill the basic needs of healthcare providers. They should be offered training opportunities to help them feel competent in a changing environment, granted autonomy and offered support to further develop their competencies, and be enabled to feel related to other physicians and learn from their peers. Finally, they should receive support to develop the skills that allow them to balance work, family, and their personal needs within this dynamic and ever-changing environment.

Research theme 1: Goals, values, and approaches to evaluation



The first theme focuses on the goals and values of and approaches to the evaluation of health professions education. Health professions education aims to train healthcare professionals to contribute to excellent care within the dynamic context of healthcare. This requires an understanding of which competences can best be trained, how education can help improve the quality of care, and how health professions education can best be evaluated.

One of the important foci in health professions education research is on defining which competencies can best be trained. Health professions education should embody the values of healthcare, as reflected in the CanMEDS roles (Frank, Snell, & Sherbino, 2015) which specify that a medical expert should not only acquire content expertise, but also learn to communicate, collaborate, manage, et cetera. Excellent healthcare requires all-round professionals who have acquired both domain-specific and generic competencies. Domain-specific competencies are directly linked to a specific profession (e.g., of a nurse, dentist, medical doctor, physio-therapist, biomedical/health scientist, pharmacist, midwife, etc.). Generic competencies, or 21st century skills, however, refer to communication skills, collaboration skills, learning skills, creative-problem solving skills, etc. These generic
competencies are also crucial as we need to prepare professionals for life-long learning so that they are able to flexibly adapt to the ever-changing healthcare context.
The acquisition of domain-specific and generic competencies should be well balanced within health professions education training programs. Generic competencies are not directly linked to a domain although most researchers will argue that they can only be developed in one or more domains. Which competencies should be developed strongly depends on the values of various stakeholders in the field, such as patients and professionals working within the various care settings, teachers, students, educational designers, but also health insurers, relevant government bodies, policymakers and society at large (O'Sullivan et al., 2012; Al-Eraky, 2015). Both these domain-specific and generic competencies should be translated into intended learning outcomes or goals to be achieved in training programs.

Questions to be answered are: How can domain-specific and generic competencies best be balanced within training programs to achieve the intended goals or competencies? How can the key values of healthcare be translated into effective training programs according to the various stakeholders? How long should a program take to reach its goals? How can we develop more flexible training programs? At which stage should competencies be trained and which ones? And to what extent do these training programs contribute to a life-long learning mentality?

Health professions education geared toward improving healthcare practices and outcomes is essential, both now and in the future. It is expected that high-quality training, notably in post-graduate and continuous education, leads to better performance on the job and, consequently, to better clinical outcomes for patients (e.g., better patient safety, fewer complications, more accurate diagnoses, lower mortality rates, etc.) (De Feijter et al., 2013; Smirnova et al., 2017).
In this way, research in health professions education can contribute to the interdisciplinary field of translational medicine because it enables healthcare providers to use new techniques and devices for the purpose of improving the healthcare system (i.e., prevention, diagnosis, and therapies).

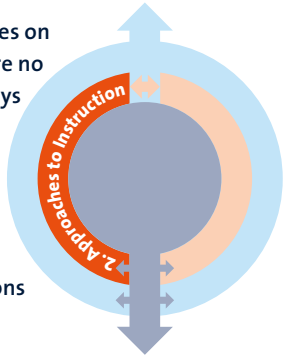
Furthermore, the sustainability of healthcare depends on the extent to which healthcare professionals are able to provide care that is both of high value and cost-conscious (Stammen et al., 2015) and have acquired job-crafting skills and competencies to deal with the high demands and workload in the workplace. The purpose of future studies is therefore to investigate how we should define quality of education and quality of care, and how they can best be measured; why and how instruction and assessment enhance (or inhibit) patient care quality and safety; and to what extent training programs support implementation of innovations in healthcare.

Evaluation of health professions education throughout the training continuum is another topic in health professions education research. Evaluation of education is nowadays aimed at achieving both accountability and improvement purposes, although continuous improvement and enhancement of education lie at its heart. Achievement of these purposes calls for five key practices: (1) providing our evaluation instruments and practices with a theoretical underpinning, by focusing on key input, process, and outcome variables based on evidence about effective learning and teaching at various levels (curriculum, course, student, teacher), (2) involving various internal and external stakeholders such as students, teachers, designers, researchers, alumni, accreditation organizations, employers, and patients (Stalmeijer et al., 2013, 2016), (3) combining multiple evaluative data and using mixed-methods approaches consistent with the principles of programmatic assessment, (4) monitoring evaluative data, reflection, and setting goals for improvement by means of dialogs with the stakeholders about the evaluative data (Van Lierop et al., 2017), and (5) creating a quality culture in which continuous quality enhancement is central (Kleijnen et al., 2014). Many institutions in higher education nowadays have systems or approaches to evaluate various aspects of their educational programs, but their effectiveness differs in practice. Questions to be answered are: How to enhance a quality culture? How to make teachers feel strongly committed to education and feel jointly responsible for the continuous improvement of education? How to encourage them to perceive giving and receiving feedback and evaluative data as beneficial for improvement? How to encourage both formal and informal collaboration on and communication about teaching and evaluative data (Kleijnen et al., 2014)? How to nurture the development of professional learning communities among students, teachers, designers, and researchers in which all stakeholders feel valued and empowered to enhance the development of a quality culture (Bendermacher et al., 2017)? How and under which conditions do approaches to evaluation promote or inhibit improvement of educational practice? How to involve and engage students, teachers, and other stakeholders as partners in the evaluation and redesign of training programs?

One of the important foci in health professions education research is on defining which competencies can best be trained. Health professions education should embody the values of healthcare.

Research theme 2: Approaches to instruction

The second research theme focuses on instruction. In education, there are no instructional approaches that always work: particular methods support particular goals under particular conditions. Thus, in order to develop evidence-informed design guidelines it is necessary to investigate specific combinations of methods, goals, and contexts.



Healthcare education in particular covers a great diversity of contexts, from classroom settings within medical schools, through public health information sessions provided in the community, to tertiary care hospitals and solo-practices in remote areas. It involves learners of all career stages whose learning goals differ widely. Therefore, in order to assess which approach works where, when, and why we need to gain a better understanding of these different contexts, the people involved, and their needs.

An advantage of a task-centered learning environment is that working on learning/professional tasks is a key element in almost all settings, which makes it possible to design educational programs that fully integrate workplace learning and learning in the educational institute. For example, Vandewaetere et al. (2015) described the design of a double-blended educational program for residents in family medicine. This program integrates not only face-to-face and online learning (the first blend), but also learning in clinical practice and in the online/face-to-face educational setting (the second blend). Another important condition pertains to the cultural and/or local setting. Methods and educational models that work in one place are not necessarily successful in another place. It could be argued, for instance, that in certain places where PBL has been adopted other approaches may have been more fruitful and that contextual differences have been overlooked or ignored (Frambach & Martimianakis, 2017). This underscores the importance of research that acknowledges such diversity and studies the effects of methods in different contexts (cultures, settings, target groups, etc.) and/or for different goals.

Instructional design models for task-centered learning environments include, amongst others, cognitive apprenticeship learning (CAL; Stalmeijer et al., 2013), first principles of instruction (Merrill, 2012), and four-component instructional design (4C/ID; van Merriënboer & Kirschner, 2018).
The educational methods under study in these models are quite similar and include: (a) modeling, (b) guidance (in a broad sense, including coaching, mentoring, and supervision), (c) reflection and types of cognitive feedback that elicit reflection, (d) articulation of -tacit- knowledge underlying task performance, and (e) exploration and guided discovery. Other methods explicitly deal with ordering of tasks, such as (f) scaffolding (i.e., gradually decreasing coaching, guidance), (g) sequencing (simple-to-complex, global before local, etc.), and (h) variability of tasks. A key question is always how to ensure that learners receive neither too much nor too little guidance, so that they feel both challenged and autonomous.

Research into domain-specific goals or competencies focuses on the development of specific guidelines for teaching medical image interpretation (Kok et al., 2017), clinical reasoning and decision-making (Durning et al., 2015, Diemers et al., 2015), and emergency skills (Dankbaar et al., 2014). Research on generic competencies, on the other hand, addresses the development of specific guidelines for teaching communication skills (van den Eertwegh et al., 2014), interprofessional skills (van Leijen-Zeelenberg, 2015), and self-regulated learning skills (de Bruin, Dunlosky, & Cavalcanti, 2017). Since the learning and teaching of domain-specific and generic competencies are always "nested," the challenge is to answer the question of how to integrate the two: healthcare providers communicate with patients about domain-specific health issues; they bring in their own domain-specific expertise in interprofessional work, and they regulate their learning of domain-specific competencies. De Bruin and van Merriënboer (2017) propose to use the cue-utilization framework to achieve this integration when acquiring self-regulated learning skills: domain-specific learning processes yield more or less valid "cues" that in turn inform self-regulated learning skills.

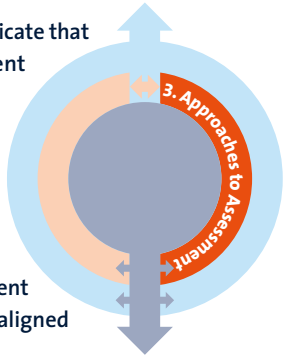
For all methods, decisions need to be made on the use of ICT and media, or multimedia. In a task-centered approach, a common model is the "flipped classroom" where theoretical information and example materials (e.g., video lectures, video modeling examples, and other learning resources) are made available online or in an "electronic study landscape," so that precious face-to-face time can be devoted to working on learning tasks under the guidance of a tutor or supervisor. Learners can work on learning tasks in clinical practice or in a simulated task environment (which can also take the form of a serious game), ranging from paper-based problems or cases ("suppose you are a nurse and one of your patients shows the following symptoms: …."), through virtual computer-based patients (Huwendiek et al., 2009) and standardized human patients in simulated settings (Tremblay et al., 2017), to real patients. Mobile devices are particularly useful to support learners who work on professional tasks in the clinical workplace (Könings et al., 2016). The possibilities of mobile devices, big data, and robotics for health are predicted to increase massively in the next decade or so, providing ample opportunity for educational research. Cognitive load theory (van Merriën

boer & Sweller, 2010, Leppink et al., 2013) provides many guidelines for improving the effectiveness of multimedia-supported learning. Such knowledge may particularly benefit older learners, whose cognitive resources are especially challenged (Van Gerven, Paas, & Tabbers, 2006). Furthermore, multimedia may help to make learning more efficient and cost-effective, for example by providing online access to instructions, limiting the need to travel, or by accommodating students' needs through increased flexibility of instructions. In addition, increased autonomy and freedom to choose one's own individualized learning trajectory make learning more appealing and motivating (together with competence and relatedness, autonomy is seen as a precondition for intrinsic motivation in the Self Determination Theory; Ten Cate, Kusurkar, & Williams, 2011), as does the provision of learning analytics to help learners personalize their learning. Thus, a key question is how new technologies can be harnessed to make learning more effective, efficient, and appealing.

In addressing instructional approaches, particular attention is paid to the social aspects of task-centered learning. In an educational setting, task-centered educational models such as problem-based learning, project-based learning, and team-based learning typically divide learners into small groups and stress the importance of collaborative learning (Dolmans et al., 2005). Also in the clinical setting, cooperation with colleagues, learning from peers, and communities of practice are typically seen as essential elements of learning and professional development (Yardley, Teunissen, & Dornan, 2012). Collaboration serves at least three goals. First, it may promote learning processes such as prior-knowledge activation, elaboration, and reflection. Second, it may help learners to develop competencies such as shared decision-making, interprofessional teamwork, and leadership skills; nevertheless, however necessary, collaboration alone will not suffice to develop these social skills effectively; hence, explicit teaching remains key. Third, by cultivating an enhanced sense of connectedness, collaboration may increase motivation in learners and contribute to the development of a professional identity. A final key question is how to organize group work and collaboration in such a way that different goals are well balanced.

Research theme 3: Approaches to assesment

Research findings consistently indicate that assessment design and assessment practices always and inevitably need compromising, and that any single assessment is bound to be flawed. High-quality assessment therefore involves a combination of carefully selected assessment methods in a program of assessment that is fit for purpose - optimally aligned with assessment purposes.



Modern models of education require assessment systems that aim at optimizing summative as well as developmental assessment functions. The theory of programmatic assessment (Schuwirth & van der Vleuten, 2011; van der Vleuten et al., 2015, Van der Vleuten, 2016) is fully in line with competency-based or task-centered approaches to education and yields a type of student assessment that is constructively aligned with the educational goals and instruction described in the previous sections. In fact, programmatic assessment theory considers assessment design to be educational design.

Programmatic assessment implies a shift from assessment of learning to assessment for learning. The basic idea is that all learning and assessment tasks that learners work on provide not only information on learning processes and acquired competencies, that is, learners' strengths and weaknesses, but also suggestions for improvement. However, as neither one single task nor one single assessment can provide complete information on all relevant competencies, any single assessment task is to be considered low-stakes (i.e., no pass-fail decision attached). In programmatic assessment, high-stakes decision-making is to be based on multiple and meaningfully aggregated assessment data only. Thus, central to programmatic assessment is the notion that, in order to collect rich and meaningful information on where a learner stands and how his or her competencies develop over time, every single assessment task (data point) is to be optimized for learning and many tasks need to be assessed with a variety of assessment instruments. Although programmatic assessment theory pre-eminently pertains to competency-based education and task-centered learning environments, its principles can be applied to other contexts as well, including selection and admission, licensing and certification or recertification, and approaches to evaluation.

A key question, then, is how to design an assessment program that is truly "fit for purpose," managing conflicts and tensions that surface when combining multiple goals in complex

systems. Overarching and recurring questions will focus on which assessment approaches work best, for whom, and under which conditions. Research therefore aims at refining programmatic assessment theory, by exploring underlying assumptions (e.g., integration of assessment for and of learning; decision-making processes; multiple role mentoring) as well as factors affecting efficiency and effectiveness of programmatic assessment approaches across different contexts.

In programmatic assessment, provision of high-quality feedback and guidance to learners is the prime purpose of each individual data point. In order to achieve this purpose, assessment data must indicate to which extent the learner meets particular standards and provide informative feed up, feedback, and feed forward to support learners' performance improvement and development into competent professionals. If standards are not met and there is insufficient improvement over time, a diagnostic process is necessary to identify possible causes and to encourage and facilitate personalized remediation (van Merriënboer & Kirschner, 2018). From this perspective, conventional feedback in the form of pass/fail decisions or grades is a poor information carrier because it contains no information on how to improve (Govaerts & van der Vleuten, 2013). Moreover, students often ignore feedback that has a summative orientation (Harrison et al., 2013) and easily interpret feedback as summative if it is lacking clear suggestions on how to improve (Heeneman et al., 2015). Thus, we need a feedback culture that fosters a sense of psychological safety, enabling learners to pro-actively seek and accept feedback, and that motivates and empowers teachers/mentors to give rich feedback, preferably in such a way that learners can use this feedback to self-regulate their learning (Govaerts, 2015). Research, then, needs to address questions about what constitutes meaningful feedback, including questions about the role of the patient or patient outcomes in assessment systems in healthcare settings. Tensions between assessment for accountability and assessment for learning may furthermore raise questions about how to develop an assessment and feedback culture that enhances learning while meeting increasing pressures for educational and professional accountability.

With regard to the use of ICT, one type of application that seamlessly fits a programmatic approach to assessment is the electronic development portfolio. In such a portfolio, all the tasks that a student has performed and all assessment information are collected. It serves three functions: (1) it provides a repository of all tasks that a student has performed as well as of formal and informal assessment feedback and other learning results, (2) it facilitates the administrative and logistical aspects of the assessment process, and (3) it enables a quick overview of aggregated information such as overall feedback reports across sources of information (Driessen, 2017). ICT can also be used to strengthen the feedback process.

For example, progress testing has been implemented in most Dutch medical schools and yields information regarding the student's progress across the program in terms of medical knowledge acquisition: Learning analytics can then be used to give students both individualized feedback on their progress and advice as to which topics they need to restudy (Donkers, 2009). ICT can also help to make assessment more efficient and cost-effective. For example, adaptive progress testing can greatly reduce the time needed for testing and still fulfill its formative function (Muijtjens, 2014). Finally, ICT can give learners more autonomy, thereby making learning more appealing. For example, Spanjers et al. (2015) found that the availability of self-quizzes is an important moderator of the effectiveness of blended learning environments, probably because they help learners self-regulate their learning. Relevant questions thus address implications of rapidly and dramatically changing technologies (e.g., artificial intelligence; learner analytics) for assessment design and implementation.

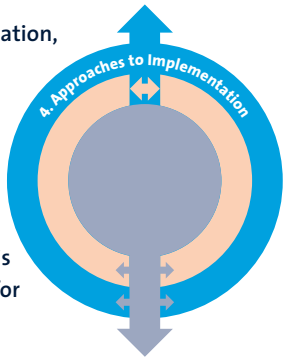
Educational programs have to transform learners into graduates that are not only fit for today's healthcare practice, but also prepared to remain competent throughout their professional careers in unpredictably and rapidly changing work environments. From this perspective, task-based instruction and assessment need to pay attention to generic as well as domain-specific competency domains, covering all aspects of professional competence. Especially generic competencies or generic aspects of real-life task performance, which are often at stake when things go wrong in healthcare practice, are difficult to gauge with quantitative assessment instruments such as checklists. Rather, narrative expert judgments are required to prevent trivialization and to make assessments fulfill their informative function (van der Vleuten et al., 2015). With regard to conditions, work-based assessment faces somewhat other challenges than programmatic assessment in the educational institute. Within the educational institute educators can rely on a broad range of standardized assessment tasks for which assessment technology and theory are fairly well established. In work-based assessment, however,

assessment tasks (i.e., professional tasks) are inherently unstandardized and interpretation of task performance is typically task- and context-dependent. Consequently, work-based performance assessments can only be understood "in situ" and are best viewed as socially situated interpretive acts (Govaerts & van der Vleuten, 2013). Important questions therefore address the refinement of theories on work-based assessment, but also examine meaningful interpretations of varied and differing assessment data; the role of qualitative assessment approaches (e.g., interpretation of narratives and the role of language in determining assessment outcomes), and cultural factors affecting effectiveness of assessment approaches.

Modern models of education require assessment systems that aim at optimizing summative as well as developmental assessment functions.

Finally, the strong focus of programmatic assessment on the formative function of assessment leaves open the question of how to organize summative assessment, that is, how to organize high-stakes assessments for making pass/fail and certification decisions. Such assessments must be based on many data points of rich information, that is, rest on broad sampling across situations, methods, and assessors (Driessen et al., 2012) and typically rely on human judgment. This calls for research focusing on the role of expert judgment in decision-making and on the design of assessment systems that support trustworthy decisions about a learner's competence level. Relevant questions are related to the composition and functioning of assessment panels and to the standard setting as well as the structuring of assessment processes to ensure robust decision-making (e.g., portfolio requirements).

Research theme 4: Approaches to implementation



Research on approaches to evaluation, instruction, and assessment will provide insight into what will work best, for whom, and under which conditions. Yet, the implementation or realization of such approaches in educational programs or curricula in practice is never a straightforward process for at least two reasons.

First, the effects of approaches to evaluation, instruction, and assessment are always mediated by perceptions and expectations of students, teachers, and other stakeholders. Second, each local context will differ to some extent from the context in which the approach was developed and/or in which prior research was conducted, necessitating adaptation and contextualization or even a more fundamental rethinking of the approach. The key question that arises then is: What happens when educational approaches and innovations are implemented in practice? How can these be optimized to meet the expectations of different stakeholders and be integrated within existing educational and institutional structures and cultural dynamics?

With regard to the importance of expectations and perceptions, it should be clear that a new learning environment can only be successful when its underlying methods are not directly opposing student expectations and perceptions. Since students are more satisfied when a new environment lives up to their expectations and less satisfied when it does not, it is important to carefully prepare them for curricular changes (Könings et al., 2008). The same holds for teachers when they have to implement new educational approaches and innovations, especially when they were not involved in the design process. If new teaching methods are not carefully aligned with teachers' expectations and perceptions, they will simply not use these methods or adjust them in such a way that they become more in line with their own beliefs. What complicates the situation even further is that educational innovations affect not only teachers and students, but also other stakeholders (e.g., designers, management, workplace supervisors, support staff) who may all have different expectations and perceptions. By involving the different stakeholders in the co-design of education, their different perspectives can be taken into account in the design, thereby contributing to optimal teaching and learning and helping achieve the intended learning outcomes or goals (Könings, Seidel, & van Merriënboer, 2014). One important research question is, therefore: How to take expectations and perceptions of all stakeholders into account in the design and implementation of educational innovations?

In this regard, educational change management theories stress the importance of co-creation and co-production, that is, the deep involvement of stakeholders in the innovation process. Co-creation or participatory design approaches are important in all different phases of this process, from the specification of educational goals and approaches, through the alignment of these approaches with physical learning spaces, to the realization of educational buildings - although different groups of stakeholders may be dominant in different phases of this process (Van Merriënboer et al., 2017; Dolmans & Tigelaar, 2012). Yet, in all phases students and teachers play a central role, preferably by creating student-staff partnerships as promoted in the CORE concept of Maastricht University (Collaborative Open Research Education; Maastricht University, 2016). Furthermore, in the context of globalization, educational institutions increasingly set up new education modalities in international contexts, such as cross-border curriculum partnerships, joint degree programs, and other forms of international collaboration, which offer new possibilities and opportunities, as well as challenges, for co-creation (Waterval et al., 2015). In cross-border curriculum partnerships, for example, co-creation with the international partner can apply to and benefit the educational programs at both the home and the host institution (Waterval et al., 2017). At the same time, however, intercultural communication and international collaboration in education have been noted as challenging and requiring thoughtful approaches (Waterval et al., 2017). An important question is, therefore: How to best organize participation and co-creation in different types of local and international educational innovation projects?

A key issue in the innovation and implementation of education is the professional development of teachers and educational management, which is an essential part of the strategy to involve all important stakeholders. Especially task-centered learning environments, which stress the multidisciplinary nature of professional tasks and the longitudinal development of competencies, call for strong educational leadership and management in order to monitor educational quality and provide educational support. Health professions educators need to be prepared for different roles, such as that of a member of multidisciplinary design and teaching teams, a tutor, supervisor, and student coach. The key to preparing them is to offer a faculty development program; that is, a coherent and flexible set of instructional formats and content that build upon each other, are closely related to various teaching roles, and can be flexibly adapted to the personal needs of a faculty member, including work on projects or innovations, and opportunities to practice in the workplace. In addition, professional learning communities should be created in which teachers continuously share and reflect on their teaching practices, develop a shared vision about teaching, mutually enhance their learning, coach each other, and build partnerships with other teachers, researchers, and students

A key issue in the innovation and implementation of education is the professional development of teachers and educational management.

(Steinert et al., 2016). This is where the circle closes: Teachers who work with their students in a task-centered learning environment are best trained in a task-centered learning environment themselves. Like their students, health professions educators learn foremost by working on meaningful and challenging tasks that help them develop necessary competencies, in an environment that fosters the establishment of formal and informal communities of learners (Schreurs, Huveneers & Dolmans, 2016). An important question is, therefore: How to design task-centered learning environments in ways that facilitate the training and development of health professions educators who teach and work in task-centered learning environments?

Besides involving stakeholders in educational innovation and implementation, it is crucial to take into account the existing institutional, educational, and cultural context in which the innovation is to be embedded. Institutional structures, as well as an organization's readiness for change, have a substantial influence on the success and uptake of an innovation, such as curriculum change (Jippes et al., 2013). Furthermore, educational practices, beliefs, and values differ between institutions, both nationally and internationally, which needs to be considered when implementing educational methods and innovations that were developed and investigated elsewhere (Frambach et al., 2012). Popular educational approaches and frameworks, such as PBL and competency-based medical education (CBME, e.g. the CanMEDS framework), have been adopted by many institutions around the world, resulting in successes as well as in problems and criticism (Frambach et al., 2017). Educational approaches inherently carry with them a set of values and beliefs that reflects the context in which they were originally developed. Awareness of the historical, political, and cultural origins of educational approaches will help determine how and to what extent the approach might be applicable to other settings, as well as how it might be adapted and contextualized. Simultaneously, such awareness can help in continuously rethinking and improving the approach by learning from how it has been applied or rejected in other settings and why. In sum, an important question is: How can and should institutional, educational, and cultural values and structures be taken into account when implementing educational innovations, and how can we share and learn from educational innovation worldwide?

Closing remarks

Four themes were described in this program: Research on the goals and values of and approaches to evaluation; research on approaches to instruction; research on approaches to assessment; and research on approaches to implementation.

In our description, we focused on interesting research questions to ask, not on the research methods that can be used to answer these questions. In terms of research methods, the program uses all methods that may help to answer relevant questions, ranging from descriptive-qualitative studies and experimental-quantitative studies, through narrative reviews and statistical meta-analyses, to short intervention studies and longitudinal design-based research projects. Yet, where possible, if at all, methods are combined (mixed methods, triangulation) to strengthen the reliability, reproducibility, validity, and trustworthiness of research findings.

It should be stressed that the research program described here emphasizes task-centered learning, which is learning by working on professional tasks in the clinical workplace or on learning tasks in the educational institute. These tasks, moreover, are based on professional tasks but take the form of problems, projects, or cases. The research program also addresses questions related to approaches to evaluation, instruction, assessment, and implementation of task-centered learning environments. It mainly differs from other research programs in educational sciences in its main focus on education in the health professions setting. It aims to answer questions that emerge in health professions education, and the answers in turn aim to positively influence health professions education. We aspire to conduct high-quality research with the ultimate goal of providing a stepping stone to the improvement of health professions education worldwide, thereby helping raise the quality of healthcare.

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Appendix 2h
List of PhD thesis 2018-2020

| PhD Defenses 2020

Iqbal, Z.
All stakeholders matter in faculty development: Designing entrustable professional activities for small group facilitation
Date of defense: December 15, 2020
Supervisors: J.J.G. van Merriënboer, K.D. Könings, M. Al-Eraky

Tran, QT.
Nationwide implementation of medical skills training laboratories in a developing country: studies from Vietnam
Date of defense: December 9, 2020
Supervisors: A.J.J.A. Scherpbier, J. van Dalen, E.P. Wright

Pacifico, J.
Making the Implicit Explicit: Uncovering the Role of the Conceptions of Teaching and Learning and the Perceptions of the Learning Climate in Postgraduate Medical Training.
Date of defense: November 30, 2020
Supervisors: C.P.M. van der Vleuten, S. Heeneman

Nishigori, H.
Why do doctors work for patients? Medical professionalism in the era of neoliberalism
Date of defense: November 17, 2020
Supervisors: T. Dornan, J.O. Busari

Oudkerk Pool, A.
Competency-based portfolio assessment – Unraveling stakeholder perspectives and assessment practices
Date of defense: November 6, 2020
Supervisors: E.W. Driessen, A.D.C. Jaarsma, M.J.B. Govaerts

Geel van, K.
Lifelong learning in radiology: all eyes on visual expertise
Date of defense: November 5, 2020
Supervisors: J.J.G. van Merriënboer, S.G.F. Robben, E.M. Kok

Stammen, L.
Pursuing - High-Value, Cost-Conscious Care - The Role of Medical Education
Date of defense: October 16, 2020
Supervisors: L.P.S. Stassen, F. Scheele, E.W. Driessen, R.E. Stalmeijer

Meulen van der, M.
Assessment of physicians' professional performance using questionnaire-based tools
Date of defense: October 15, 2020
Supervisors: M.G.A. Oude Egbrink, M.J.M.H. Lombarts, S. Heeneman, C.P.M. van der Vleuten

Matsuyama, Y.
Contextual attributes fostering self-regulated learning in a teacher-centered culture: learner's professional identity formation is a trigger
Date of defense: October 5, 2020
Supervisors: C.P.M. van der Vleuten, J. Leppink

Rovers, S.
Growing knowledge, supporting students' self-regulation in problem-based learning
Date of defense: September 16, 2020
Supervisors: J.J.G. van Merriënboer, A.B.H. de Bruin, H.H.C.M. Savelberg

Bourgeois-Law, G.
Conceptualizations of remediation for practicing physicians
Date of defense: September 3, 2020
Supervisors: P.W. Teunissen, G. Regehr, L.V. Varpio

Giuliani, M.
A Critical Review of Global Curriculum Development, Content and Implementation in Oncology
Date of defense: May 19, 2020
Supervisors: E.W. Driessen, J. Frambach, T. Martimianakis

Schreurs, S.
Selection for medical school; the quest for validity
Date of defense: March 20, 2020
Supervisors: M.G.A. Oude Egbrink, J.A. Cleland, C.B.J.M. Cleutjens

Schumacher, D.
Resident Sensitive Quality Measures: Defining the Future of Patient-Focused Assessment
Date of defense: March 19, 2020
Supervisors: C.P.M. van der Vleuten, J.O. Busari, C.L. Carraccio, E. Holmboe

Sehlbach, C.
To be continued…. Supporting physicians' lifelong learning
Date of defense: February 21, 2020
Supervisors: E.W. Driessen, G.G.U. Rohde, F.W.J.M. Smeenk, M.J.B. Govaerts

| PhD Defenses 2019

Kikukawa, M.
The situated nature of validity: Exploring the cultural dependency of evaluating clinical teachers in Japan
Date of defense: December 17, 2019
Supervisors: A.J.J.A. Scherpbier, R.E. Stalmeijer

Kelly, M.
Body of knowledge. An interpretive inquiry into touch in medical education
Date of defense: Decemer 10, 2019
Supervisors: A.J.J.A. Scherpbier, T. Dornan, N. King (University of Huddersfield, UK)

Klein, D.
The performance of medical record review as an instrument for measuring and improving patient safety
Date of defense: November 6, 2019
Supervisors: R.P. Koopmans, M.H. Prins, R. Rennenberg

Bollen, J.
Organ donation after euthanasia: medical, legal and ethical considerations
Date of defense: Novemer 1, 2019
Supervisors: W.N.K.A. van Mook, L.W.E. van Heurn, M.M. ten Hoopen, D. Ysebaert

Wagner-Menghin, M.
Self-regulated learning of history-taking: looking for predictive cues
Date of defense: September 25, 2019
Supervisors: J.J.G. van Merriënboer, A.B.H. de Bruin

Wilby, K.
When numbers become words: Assessors' processing of performance data within OSCEs
Date of defense: July 2, 2019
Supervisors: D.H.J.M. Dolmans, M.J.B. Govaerts, Z. Austin (University of Toronto, Canada)

Szulewski, A.
Through the eyes of the physician: Expertise development in resuscitation medicine
Date of defense: June 20, 2019
Supervisors: J.J.G. van Merriënboer, A. Gegenfürtner

McGill, D.
Supervisor competence as an assessor of medical trainees; Evaluating the validity and quality of supervisor assessments
Date of defense: May 29, 2019
Supervisors: C.P.M. van der Vleuten

Van Rossum, T.
Walking the tightrope of training and clinical service; The implementation of time variable medical training
Date of defense: February 28, 2019
Supervisors: I.C. Heyligers, F. Scheele, H.E. Sluiter

| PhD Defenses 2018

Amalba, A.
Influences of problem-based learning combined with community-based education and service as an integral part of the undergraduate curriculum on specialty and rural workplace choices
Date of defense: December 20, 2018
Supervisors: W.N.K.A. van Mook, A.J.J.A. Scherpbier, F.A. Abatanga (Tamale, Ghana)

Melo, B.
Simulation Design Matters; Improving Obstetrics Training Outcomes
Date of defense: December 12, 2018
Supervisors: J.J.G. van Merriënboer, C.P.M. van der Vleuten, A.R. Falbo (YMIP, Brasil)

Olmos-Vega, F.
Workplace Learning through Interaction: using socio-cultural theory to study residency training
Date of defense: December 7, 2018
Supervisors: D.H.J.M. Dolmans, P.W. Teunissen, R.E. Stalmeijer

Chew, K.
Evaluation of a metacognitive mnemonic to mitigate cognitive errors
Date of defense: December 6, 2018
Supervisors: J.J.G. van Merriënboer, S.J. Durning (USUHS, Bethesda Maryland)

Sukhera, J.
Bias in the Mirror. Exploring Implicit Bias in Health Professions Education
Date of defense: November 29, 2018
Supervisors: P.W. Teunissen, C.J. Watling (Western Ontario, Canada), L. Lingard (Western Ontario, Canada)

Mogre, V.
Nutrition care and its education: medical students' and doctors' perspectives
Date of defense: November 7, 2018
Supervisors: A.J.J.A. Scherpbier, F. Stevens, P.A. Aryee (Tamala, Ghana)

Ramani, S.
Swinging the pendulum from recipes to relationships: enhancing impact of feedback through transformation of institutional culture
Date of defense: October 31, 2018
Supervisors: C.P.M. van der Vleuten, K.V. Mann † (Dalhousie, Canada), S. Ginsburg (Toronto, Canada), K.D. Könings

Winslade N.
Community Pharmacists' quality-of-care metrics. A prescription for improvement
Date of defense: October 23, 2018
Supervisors: C.P.M. van der Vleuten, R. Tamblyn (McGill, Canada), L.W.T. Schuwirth (Flinders, Australia)

Eppich, W.
Learning through Talk: The Role of Discourse in Medical Education
Date of defense: October 10, 2018
Supervisors: P.W. Teunissen, T. Dornan, J.J. Rethans

Wenrich, M.
Guided Bedside Teaching for Early Learners: Benefits and Impact for Students and Clinical Teachers
Date of defense: September 12, 2018
Supervisors: A.J.J.A. Scherpbier, P.G. Ramsey (Washington, USA), H.A.P. Wolfhagen

Marei, H.
Application of Virtual Patients in Undergraduate Dental Education
Date of defense: September 7, 2018
Supervisors: J.J.G. van Merriënboer, H.H.L.M. Donkers

Leenen, L.
Self-management in Epilepsy; The Goal is: "Live with a Z(s)mile"
Date of defense: September 7, 2018
Supervisors: H.J.M. Majoie, S.M.A.A. Evers, C.M. van Heugten

Waterval, D.
Copy but not paste, an exploration of crossborder medical curriculum partnerships
Date of defense: April 26, 2018
Supervisors: E.W. Driessen, A.J.J.A Scherpbier, F.M. Frambach

Smirnova, A.
Unpacking quality in residency training and health care delivery
Date of defense: April 4, 2018
Supervisors: C.P.M. van der Vleuten, M.J.M.H. Lombarts (UvA), O.A. Arah (California, Los Angeles, USA), R.E. Stalmeijer

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