Faculty of Psychology and Neuroscience

Chapter 4
Faculty of Psychology and Neuroscience: The Psychology Student as Researcher

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Faculty	Psychology and neuroscience
Number of MaRBLe students	Approximately 50 students per academic year
Staff- or student-initiated	Student-initiated
Individual- or group-based	Individual
Phase	Undergraduate – third year
Credits	18 ECTS
Length	One semester (5 months)
Dissemination/output	Seminar, bachelor's theses, publications in (peer-reviewed) journals, MaRBLe-Series

Introduction

As noted by Elsen et al. (2009), undergraduate research projects should be customised to fit research processes, outcomes, and the social context in which research takes places. The diverse nature of research at the Faculty of Psychology and Neuroscience (FPN) presents one argument for the implementation of tailor-made undergraduate research. Another, more cogent argument is that student prosumers are more likely to put their creativity and curiosity into a project that is tailored to their specific research interests (see also Box 4.1). This chapter reports on the implementation and outcomes of the tailor-made Maastricht Research-Based Learning (MaRBLe) programme in the FPN bachelor's curriculum.

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Even before the development of MaRBLe, the psychology bachelor's curriculum had a marked research-focused quality, although it resisted straightforward classification along Healey and Jenkins' (2009) dichotomies. The curriculum was research-led in that teachers often recommended research papers which students were expected to digest. At the same time, it was research-oriented, as the bachelor's curriculum contained many courses focusing on processes of knowledge construction, including statistics, methodology, writing and critical thinking courses, as well as regular discussions of experimental designs in problem-based learning (PBL) courses that focused on specific psychological content. The curriculum also contained research-tutored elements: regular PBL tutorial group meetings served as a platform for discussing papers, and several writing-intensive courses were building up to a capstone bachelor's thesis. In addition, research-based elements were in place in the first 2 years, most notably a ten-ECTS research practical which challenged small groups of five to seven students to actively conduct research themselves under the supervision of a researcher. Finally, motivated students could incidentally choose to pair up with a researcher during a research-intensive elective in the third year. The latter option allowed for a greater number of research competencies for talented and motivated students: MaRBLe was to yield a highly individualised serving of research-based learning (RBL).

The dimensions listed by Beckman and Hensel (2009; see also Chap. 3 for a full description of the continua) help to describe MaRBLe and undergraduate research at FPN. First, it is student- and process-centred, because it provides individual students with the opportunity to mould their own learning experience. To some extent

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Box 4.1: Creativity

By Eline Primowees, MaRBLe student and jury member, annual duct tape award for most creative project

Creative, original thought is as important to the research process as practical skill. However, creative proficiency in academia is much more elusive and challenging to develop than, for example, an overview of a discipline's history or the ruleset of a scientific publication. Exactly where and when does the creative magic happen? What does it take to pursue the spark that turns an idea into a scientific journey? Creating opportunities for students to experience the full implication of following through on this creative spark is what I believe to be the core ambition of the MaRBLe programme. To welcome a creative approach at an early stage of academic education serves as a huge practical encouragement to budding researchers. Often, creative ingenuity is valued secondary to technical prowess or fact retention. That even the most gifted researcher has to learn to roll with the punches of hands-on research is usually an afterthought – a daunting, unknown, rather than a creative opportunity. Enjoying the trust and freedom to see an interesting idea through nourishes the creative self-confidence required to earn one's keep in academia.

It introduces students to the idea that not only could they pursue a PhD but that this endeavour might be rewarding and fun. Giving a self-developed study, a practical twist makes the experience more visceral than any challenge offered through a third party could. It really is the icing on the cake that is problem-based learning, because it challenges students to set their own creative standards and live up to them (Fig. 4.1).

Fig. 4.1 MaRBLe student Eline Primowees

it is also outcome and product-centred in that MaRBLe will result in an empirical bachelor's thesis. Undergraduate research is usually student-initiated, although in some subdisciplines faculty members who may, for instance, possess advanced laboratory skills students do not master and invite students to take part in their research.

Since all students have the opportunity to hone research skills in the first 2 years of the bachelor's, the research opportunities offered in the third year are reserved for a select group of students. The target group of this MaRBLe track consists of students whose grade point average (GPA) places them in the top 20% of their class, as well as students with lower GPA scores, who, during previous research-intensive courses, have demonstrated that they are highly motivated to engage in experimental psychological research. MaRBLe is clearly curriculum-based: engagement in an individual, tailor-made research project is the culmination of a series of research-intensive courses and activities. Unlike preceding undergraduate research activities that require teamwork, it is focused on the individual. MaRBLe entails discipline-based research that is unique to the student and specific to the discipline. Students present their results both to campus audiences, including peers and staff members, and to broader audiences, for example, at research conferences for students, profes-

Table 4.1 Position of the FPN case study within the Four Components/Instructional Design (4C/ID)

4C/ID model	Translation to research-based learning at FPN
Learning tasks	Executing observational research in small groups (year 1)
	Research project in small groups (year 2)
	Individual undergraduate research for MaRBLe project (year 3)
Supportive information	Theories on quantitative and qualitative research methods (years 1, 2, 3)
	Writing-intensive courses (years 1, 2, 3)
	Critical thinking course (year 2)
	Research-led PBL (years 1, 2, 3)
Procedural information	Job aids, manuals, and guidelines to perform certain research tasks, for example, how to use SPSS or conduct archive research, obtain approval from an ethics committee, conduct a literature search, analyse experimental designs, use lab facilities, design a poster, plan research in another culture, write an empirical bachelor's thesis or journal article, and contribute to a research conference for students or professionals
Part-task practice	Data entry
	Oral presentations and discussion of research results
	Planning of data acquisition
	Handling of subjects

sionals, and scientific journals. For many students, MaRBLe deepens the desire to pursue a career in academia, which is typically kindled during one of the earlier research-based activities.

The figure below positions the FPN case study in the Four Components/Instructional Design (4C/ID) model (van Merriënboer 1997). The main learning tasks are sequenced from easy to complex. Supportive information is typically provided before or at the start of a learning task, and procedural information is provided just in time (Table 4.1).

In sum, psychology students steadily develop research competencies as they progress through the bachelor's curriculum. All students actively participate in research activities at the beginning of the first year and at the end of the second year. Supportive information is provided throughout the bachelor's, with ample attention paid to methodology, statistics, critical thinking, and scientific writing. The research-focused activities in a PBL environment are also conducive to the development of various enabling research competencies, such as self-regulation, collaboration, oral presentation, and discussion and analysis of scientific articles. Finally, selected students are allowed to conceptualise and implement an individual research project either within or outside the faculty labs, sometimes even outside the Netherlands.

By participating in the MaRBLe project, most students hone their scientific competencies. They also gain new competencies by invoking their flexibility and creativity, becoming a member of a research group, planning data acquisition, preparing meetings with supervisors, communicating with interested peers and stakeholders, and presenting results to professional and general audiences. The next section will focus on the implementation of the research activities in the third year of the bachelor's programme and on their outcomes from the perspective of both the student and faculty.

Implementation of MaRBLe

MaRBLe was designed to be a natural extension to the existing bachelor's programme. In a curriculum, it is very important to have room for innovation. The pre-existing possibility to take tailor-made individual electives in the third year of the curriculum is provided for this important degree of freedom. This generic element in the electives allowed us to embed MaRBLe in the bachelor's programme without having to completely reform the curriculum.

At the end of their second year, roughly 50 talented students are selected for a MaRBLe project, which comprises part of their electives in the third year of the bachelor's programme. These students are required to plan, conduct, and present their own individual research project under the supervision of a faculty member or an external supervisor for those who combine the MaRBLe programme with a semester abroad. In some cases, students design and set up their own MaRBLe project individually. In other cases, they do so in collaboration with their supervisor. In the final stage of the MaRBLe project, students write a report on their research, resulting in an empirical bachelor's thesis (see also Fig. 4.2). Below we will describe the complete cycle step by step.

Selection and Admissions

The second-year students who rank in the top 20% of their cohort, based on their GPA from their first three semesters, are invited to take part in the MaRBLe programme without additional admission requirements. In parallel, students who are not in this ranking are also invited to apply based on their motivation and a personal reference from their supervisor during the second-year research project that testifies to their engagement in that course. Each year, the MaRBLe programme admits an average of 5 to 10 students from among 40 to 60 candidates on the basis of motivation.

Find Topic and Supervisor

During individual meetings, the MaRBLe programme coordinators advise and assist students in pinpointing a particular research topic and recommend potential supervisors according to research expertise. This matching process is further supported by the organisation of speed dating events where students meet staff members who are interested in supervising a MaRBLe project. The large number of researchers wishing to take part in these events underlines the success of the programme. Researchers recognise that the MaRBLe programme offers an opportunity to scout for talents that can join their research groups.

Fig. 4.2 Timeline of the MaRBLe project

Design Study and Write Research Proposal

After they have been matched with staff supervisors, the student researchers are required to draft a proposal for their research project. The research proposal is a structured protocol outlining the various aspects of the proposed research. In addition to providing information on the theoretical background, specific research question, methods, and design, students are asked to consider the ethical implications of the proposed research.

Ethics Approval

All research projects must comply with ethical criteria for psychological research. It is important that the student is aware of research ethics and of how ethical rules should inform his or her practical research decisions. Therefore, all MaRBLe projects are assessed by the local ethics committee. Students submit their research proposal for ethical approval to the committee by filling out the standard application form. They are then invited for individual interviews with the ethics committee, where they receive direct feedback on their research proposal. These interviews are not part of the standard ethics procedure, but are intended to provide students with the opportunity to further comment on their plans and answer any questions which arise in direct dialogue with members of the committee. The ethical approval procedure is consequently an integral part of the MaRBLe learning experience, offering student researchers a chance to receive feedback on their proposed research from a team of experts. It promotes academic rigour and students' inclusion in the local research community (Ash Merkel 2003).

Collect Data

Once the ethics committee has given the green light, students can start building their experiments or creating their questionnaires to facilitate the collection of data. During this period, the student researchers work mostly independently, organising the data acquisition, plan experimental sessions, and communicate with research

participants. Progress is monitored by means of weekly coaching sessions with supervisors, creating an opportunity for students and supervisors to flag any problems or raise any other relevant issues. In addition, students can use the MaRBLe Facebook community to ask peers for advice on particular research problems (see also Box 4.2). Throughout the MaRBLe project, staff members involved in teaching methods and statistics are also available for advice and guidance, as it can be somewhat challenging sometimes to find the best fitting statistical analysis. In such cases, a statistical consultation can help student researchers to obtain the best results their data has to offer. Students are advised to consult the experts early on in order to gain advice about their experimental setup before starting data collection. They are further encouraged to actively utilise the strategy the experts suggest. However students often decide to collect as much data as possible prior to this in the hope of yielding something useful. The involvement of statistics teachers as counsellors helps integrate the training of these academic research skills, which tends to become isolated in undergraduate programmes (see Scheel (2002) and Slootmaeckers et al. (2013) for similar observations in sociology and political science curricula, respectively).

Box 4.2: Community Building: A Cornerstone of Education Innovation
By Emma Dekker, MaRBLe student, student assistant MaRBLe FPN, social media and event coordinator

As a MaRBLe student, there was one element I felt the programme was lacking: a sense of community among participating students. Through my experience with Maastricht University's PBL system, I had discovered firsthand that developing oneself academically is easier, more fun, and more effective when engaging in the task together with peers. When I was asked to work with the educational directors of the MaRBLe programme in order to institute community building, I jumped at the chance to help improve the programme's practical application. We constructed a general plan of action incorporating two main ingredients we believed to be essential. First, MaRBLe needed an online presence to stay in contact with students. Second, MaRBLe students needed to come together physically to stimulate a feeling of togetherness. Over the course of 2 years, we experimented with different applications and formats. Online communication tools and social media channels, such as Email, Facebook, Twitter, and WordPress, were employed and several MaRBLe-centred events were organised (Fig. 4.3). While we are still in the middle of a growth process regarding the realisation of a MaRBLe community, success has already been achieved. Presently, the MaRBLe Facebook page has 236 likes, thereby serving as the main semi-official communication channel between students and staff. Furthermore, organised events have always had a satisfactory turnout, a great ambience, and enthusiastic student evaluations. Thus, the foundation for a MaRBLe community has been laid, capable of contributing to a successful future for the MaRBLe programme.

Fig. 4.3 Emma Dekker's MaRBLe community experience

Analysis and Present Results

In parallel to the data analysis, students start writing an empirical bachelor's thesis based on their research project. They are encouraged to structure their thesis as if it were a research article. The MaRBLe supervisors also act as thesis supervisors and provide students with guidance and feedback. Moreover, MaRBLe students attend a workshop on writing about science for a wider audience. This workshop is organised in collaboration with experienced science journalists. At a later stage, they participate in a second workshop dedicated to oral presentation skills and poster design. These workshops aim to help students communicate their findings to a wide range of audiences at local and national meetings. All students present their results at the annual FPN student conference. This conference is also the focal point of the undergraduate research group projects in the second year of the bachelor's curriculum. Furthermore, MaRBLe students are encouraged to submit a version of their empirical thesis for publication in academic journals. These experiences expose students to the rigours of the peer-reviewed process, which help to ensure the validity, significance, and originality of their research. More than 20 papers have been published already, not only in journals dedicated to undergraduate research such as the local *Maastricht Student Journal of Psychology and Neuroscience* but also in renowned peer-reviewed international journals such as *NeuroImage*, *Health Psychology*, and *Experimental Brain Research*. Over 50 students have presented their research at both national and international conferences, supported by special MaRBLe travel grants.

MaRBLe Abroad

Many students choose to spend the first half of their third year abroad. During this semester they study at partner universities in other countries within and outside Europe. To accommodate these students in completing a research project requires a lot of extra commitment and preparation (see also Box 4.3). For many research projects, some form of local support or supervision is indispensable. Based on the student's interest, colleagues from these partner institutions are approached through existing peer collaborative networks or contacted directly by the MaRBLe programme coordinators. In this way, MaRBLe not only strengthens existing research collaborations but also creates new ones. In certain cases, students collect their data online and are also supervised online via email and Skype. In many cases, students exploit their place of study by researching topics that can only be studied there, for example, researching why the Brazilian population exhibits high levels of perceived well-being or investigating attitudes towards punishment in a collectivist environment in Seoul, South Korea.

Box 4.3: MaRBLe in Hong Kong
By Roderick Bronzwaer, MaRBLe student abroad

In 2012, I opted to and was allowed to take part in the MaRBLe programme while following electives at one of the many universities of Hong Kong, the City University of Hong Kong (CityU; Fig. 4.4). In addition to the obvious increase in physical distance between student and supervisor, there too existed an increase in mental distance between student and research population, as the assumption that its members adhere to a holistic train of thought, characteristic of the Asian people, is not unwarranted. Not only did I gain hands-on experience with conducting original research, since Maastricht University had no previous ties with CityU, I also felt forced to home in on issues that demanded diplomacy which are particularly common for PhD candidates or postdoc researchers. Obtaining ethical consent, formal supervision, and access to assets from this university, while respecting the requirements imposed by the immigration department, proved to be the most time-consuming of all, yet honed my practical problem-solving skills more than anything. Though my claims are anecdotal in nature, I believe that there may be an interactional effect on the learning process between undergraduate research and the environment in which it is conducted. Specifically, the independent nature of undergraduate research in a foreign institute may lead to a natural steepening in the slope by which the amount of support and guidance is decreased throughout the scaffolding process (i.e. independent performance of a task sets in much earlier). In all, the hurdles faced throughout the MaRBLe programme in Hong Kong helped open my gaze to the possibilities in international research (perhaps even more than my research as a graduate did), something for which I am truly grateful.

Fig. 4.4 Roderick Bronzwaer's MaRBLe experience

A Sense of Belonging

In the MaRBLe programme, students have the opportunity to rub the shoulders with the best and brightest researchers in our own department and in labs at partner universities. Driven by their own curiosity, students team up with experienced researchers to further their knowledge of human behaviour in collaborative research projects, where the experience and expert knowledge of the researcher are transmitted to the student much like the craft of cabinet making was taught by the master to the apprentice in the past. The psychological and physical proximity to experienced researchers yields great benefits in terms of both satisfaction in the process and academic achievement. Students who participate in MaRBLe experience that their learning is of higher quality (cf. Trigwell 2005). MaRBLe students have become the pick of the litter for research master's programmes. More than a third of the MaRBLe students from the first cohort have already started a PhD project. In some exceptional cases, they have even secured funding to continue the same line of research they started as an undergraduate in the MaRBLe project (see Box 4.4).

Box 4.4: A Journey from Student to Supervisor
By Sanne ten Oever, MaRBLe student and supervisor

For me, research was something I had to experience before I could understand what it entailed. In 2008, I joined the MaRBLe team to find this out. One fellow student likened the MaRBLe project to Columbus and his maritime voyage of discovery. She handed out fruit to all of us during the first plenary meeting to prevent us from getting scurvy. As a MaRBLe sailor, I was able to perform a full study starting by formulating a research question and preparing data collection. I ended up writing a paper and ultimately publishing it. In this way I executed things I did not know were part of research and might not have experienced during a bachelor's without individualised research opportunities. As my character has always been to go in depth and find the final answers to questions, I enjoyed MaRBLe immensely and naturally continued pursuing a career in science. After I had started my research master's in Cognitive Neuroscience at Maastricht University, I did an internship in New York at Columbia University following up on my MaRBLe research. I think being part of MaRBLe gave me a big head start in science as I was experienced with performing empirical research and had even published a paper (Fig. 4.5). As a consequence, I wrote a grant proposal to pursue a PhD in Maastricht, which I was awarded. At the moment, the beginning of 2015, I am in the third year of my PhD and still part of the MaRBLe team, but now on the other side. I am currently guiding two students in their MaRBLe projects and enjoy seeing them find answers to the same things I was discovering 6 years ago. This also shows that MaRBLe is more than a course to me: it has been a journey that is still not complete.

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The sound of size
Crossmodal binding in pitch-size synesthesia: A combined TMS, EEG and psychophysics study

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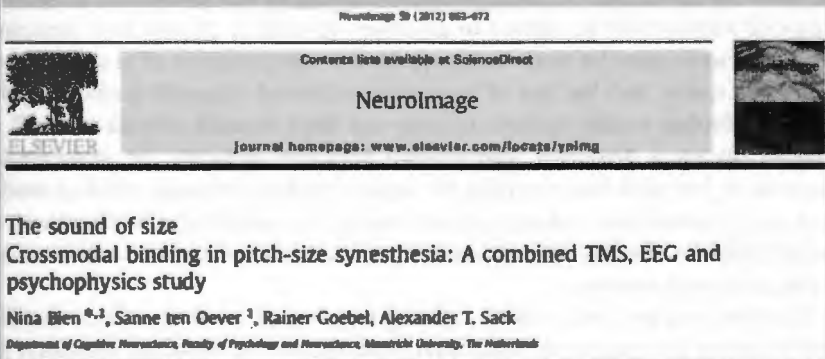
Fig. 4.5 Sanne ten Oever's MaRBLe experience

Discussion

The MaRBLe programme has played a pivotal role in further strengthening the links between teaching and research in our department. Experimental research in psychology, with its clear empirical cycle, appears to lend itself excellently to an academic research-based learning approach. The involvement of undergraduate students in the local research community has yielded many benefits, not only with respect to the overall quality of education in the bachelor's curriculum but also to students and staff involved. Original ideas proposed by students have inspired several new lines of research. Many active researchers have become involved in teaching undergraduates for the first time and have been able to share their passion for research. Student research provides a natural vehicle for the cultivation of both academic and professional skills. Training in research methods, statistics, and other skills no longer only occurs in isolation. What could be a better motivation for mastering these skills than to satisfy your own curiosity?

Organising MaRBLe alongside the regular curriculum requires careful planning. Conflicting demands on resources, for example, the availability of sufficient lab space and research participants, need to be considered. The fact that the MaRBLe programme obviously adds to the student's credentials for admission to graduate programmes also holds a potential danger: MaRBLe could become an instrumental choice. Students who are driven by general career motives rather than by their own curiosity are less likely to achieve an advanced level of engagement and autonomy which could, in turn, adversely affect the quality of the student research. Furthermore, tensions between the choices that are open to students could have serious implications. If talented students go abroad, for instance, so must their research. In such cases we will need to invest heavily in order to uphold the MaRBLe programme as the jewel in the crown of research-based learning in our bachelor's programme. Financial support will be needed to empower students to pursue their passion for research. Funds must be made available for the compensation of research participants, lab space, and the use of expensive advanced research methods such as fMRI. To further enable students to carry out their research abroad, we will also need to set up a dedicated international exchange network for undergraduate research. In line with the principles for regular student exchange, visiting students from a selection of our exchange partner institutions should also be eligible to take part in MaRBLe, but this can only work if strict criteria are applied in terms of level of education and training.

Learning is at the core of both teaching and research (see also Brew and Boud 1995). During their university education, students have to make the transition from knowledge consumers to knowledge producers. The ability to deal with novel information sets academic professionals apart from people with a more vocational education. Boyer's ideas on scholarship (1990) offer a nice framework for mapping the links between teaching and research further (Brew 2003). His notion of the scholarship of discovery and the related concept of research as a personal journey of discovery is echoed in our students' testimonials, both scientific and personal, about their MaRBLe experience.

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