Resource-focused Research for Multilingual Competence in Scientific Writing

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Abstract

This research aims to analyse the situation of the multiliteracy of natural sciences students in their academic writing in the German university context and to identify students' awareness and applications of their multilingual writing competence as well as how they make use or not of it in their academic writing process. English has the status of lingua franca in this context and German is used in informal settings. Minutes, reports, reviews, Bachelor or Master theses have to be written in either English or German, depending on the study programme. As Canagarajah (2013) has pointed out, multilingual scholarship offers huge resources in terms of diversity of thinking because language carries with it a system of knowledge and thinking from which both their representatives and the writing scientific community can benefit. The empirical, qualitative study of this paper is based on interviews conducted with participants of the course 'Akademisches Schreiben für Naturwissenschaftler/innen' (Academic Writing for Natural Sciences Students), offered by the International Writing Centre at Göttingen University. The qualitative content analysis is based on portfolio activities and interviews conducted with students. This paper presents the first results of our data analysis.

Introduction

In the natural sciences, English as the lingua franca for the publication of scientific results is widely spread. Therefore, natural sciences students in Germany have to deal with English as scientific language either to access scientific results or to write academic[1] texts in the target language English. Students in natural sciences programmes in Germany are confronted with German as well, as Bachelor and Master programmes are offered either in German only or in English, sometimes in both languages. Thus, students of natural sciences have to know at least these two academic languages.

Although students have to prove their general language competence before getting accepted at the university, in most cases they lack academic skills in scientific writing in both German and English. Therefore, the International Writing Centre at Göttingen University offers and continuously develops a programme in multilingual academic writing related to natural sciences study programmes.

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[1]In this paper we distinguish between academic and scientific writing, following Fischbach/ Schindler (2013): academic writing focuses on the writing of qualification papers during students' studies, and scientific writing focusses on writing for publications.

This paper examines students' attitudes to their multilingual writing processes in order to offer didactic suggestions on how students can activate a translingual practice for academic purposes. Translingual practice (Canagarajah 2013) in this context means using both academic languages (German and English) in a dynamic, enhancing process. However, the final qualification text must be in one target language, either German or English as the requirements of study programmes in natural sciences postulate it.

To assist students in learning more about academic writing processes, the International Writing Centre at Göttingen University offers courses and individual writing consultations. Students of natural sciences are offered a course which encourages the students to write academically activating their already existing knowledge about text type conventions and of writing processes in several languages. Data from students who took part in this course has been collected and analysed with qualitative content analysis to know more about students' attitudes and individual appraisals of academic writing in a translingual practice.

The aim of this project is to bridge the gap between the institutionalised fixity concerning the acceptance of academic languages and the fluidity of languages. Our main purpose is to encourage students in their translingual practice through their academic writing processes.

This paper gives a short glimpse of the situation at German universities, followed by a brief presentation of the course contents, continuing with the research base of the analysis and eventually points out the first results concerning the use of multilingual competence in scientific writing by students of the natural sciences at Göttingen University.

Languages in natural sciences study programmes at German Universities

The reality of the natural sciences programmes at German universities is unique if compared to that of other universities in Europe. According to data from the European Commission and DAAD (October, 2013), English is the language of instruction in 14% of the Bachelor programmes of natural sciences in Germany, while over 80% of the programmes are taught exclusively in German. A minority of programmes are taught in the combination of English and German (5.4%) (see Fig. 1). The linguistic situation of Master programmes differs substantially to that of Bachelor programmes: over 30% of the programmes are offered exclusively in English, while over 17% are in English and German and less than half in German only (see Fig. 2). This can be visualised below (Fig. 1 and 2); the numbers inside the pie charts are the actual number of programmes in Universities in Germany.
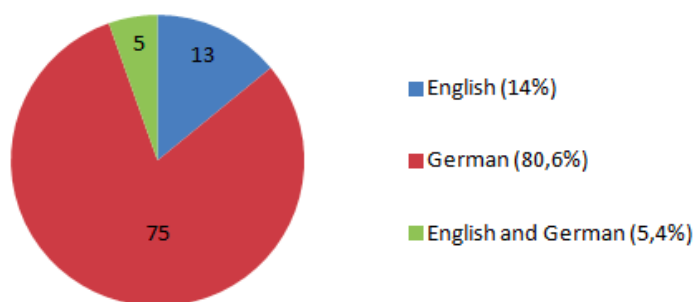

Figure 1. Languages in Natural Science Bachelor Study Programmes in German Universities
(Based on information available on the website of the European Commission 2013)
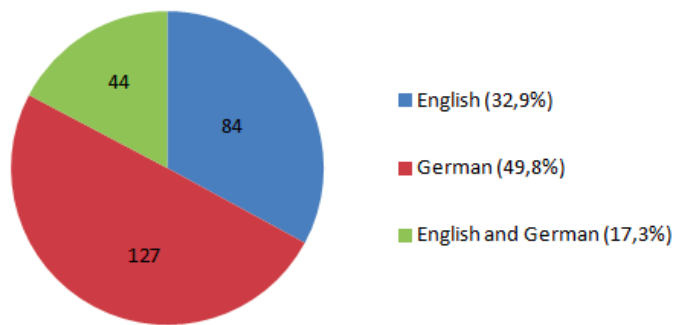
Figure 2. Languages in Natural Science Master Study Programmes in German Universities
(Based on information available on the website of the European Commission 2013)

Concerning the natural sciences programmes at Göttingen University, the context is as follows: in the Bachelor degree, the instruction language of the ten programmes is German; in the Master programmes, German is the language in less than 40% of the programmes only, while over 55% are only taught in English and 5.6% of the programmes in English and German (see Fig. 3). The numbers inside the pie chart are the actual number of programmes in Göttingen.
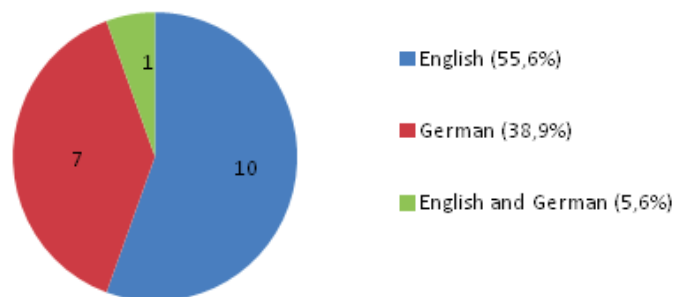

Figure 3. Languages in Natural Science Master Study Programmes at Göttingen University, Germany
(Based on information available on the website of Göttingen University 2014)

Something singular to the natural sciences programmes at German universities is the fact that even when the programmes are taught in German, students are usually required to hand in papers and assignments in English. That means that students need the competence of at least two academic languages to succeed in their written exams and oral presentations. Bearing that in mind, the International Writing Centre at Göttingen University offers a course for natural sciences students every semester, aiming at helping them develop this competence, which will be explained below.

Research Base

Language dynamics in crosslanguage contexts carry many labels. These begin from *plurilingualism* as named by the Council of Europe, go further to *metrolingualism* (Pennycook 2010), extend and adapt to certain world contexts as *heterography* (Blommaert 2008) used for the African context. The term chosen and suitable for the purpose of this project is Canagarajah's *translingual practice* (Canagajarah 2013). This is appropriate due to several reasons of which the most important is that translingual practice refers to language as ongoing and fluid processes and not as fixed entities categorising and naming them German, English, Spanish and so on.

Scientific writing seen as scholarly communication developed mainly from spoken communication, distanced itself from it for a long period of time (Ehlich 2006) and the latest research approaches in Multilingualism, English as a Lingua Franca, English Language Acquisition try to re-establish the connection between one's

language repertoires (Canagarajah 2013). The present paper desires to fulfil and complete this approach to scientific writing as a tool of communication between scholars. Since scientific writing serves the purpose of communication, it should firstly consider its dynamics and secondly its diverse emerging contexts. These two are not only ethical principles but also the only way to deal with writing as process engaging in a multitude of changes and developments throughout the world depending on the languages people choose to negotiate their knowledge in. Because languages, as Coulmas (1995) claims, are social constructs and through or by the choice we make in choosing a language or having to write in a specific one, we construct or limit our scientific knowledge and include or exclude other peers and contexts, who and which by the context's conditions cannot have access to it.[2]

A whole wave of scientists, the most representative among them being Canagarajah (2013) and Cummins (1982), defended these multilingual 'cases', seeing their potential, trying not to reduce them to one thinking system. But there is still a long way to go because when we talk about languages we cannot diminish the importance of institutions and their influence on languages, especially on scientific writing. The way many writing centres all over Germany work with students is offering standard scientific writing rules and tools to teach students and peers to write and read in standard academic German as tutors understood their task as 'fixing' students' lack of standard German language skills. The same situation can be observed in Olson's approach and observation of some of the U.S. writing centres 'in providing tips and strategies for helping multilingual writers meet instructors' (monolingual) expectations, for instance, we have failed to help multilingual writers thrive as individuals and writers with agency' (Olson 2013: 2). Naturally, one could distinguish here the differences between who these tutors are and what their qualifications and aims are but there are similarities which can be drawn for many groups of tutors and which resemble Olson's description. What we deal with in today's scientific communities is a large dominance of English monolingual products and scholars, whose socialisation was mostly in one or two languages, dealt with separately.

Many scholars guide writing tactics and teaching concepts for writing in a very product-oriented manner. However, if we consider a broader view of science and scientific writing, which multilingualism and translingual practice promote, we have to include other contexts where the focus lies more on the 'making' or the process of the 'product'. Such a change of emphasis would mean to develop theoretical based concepts of establishing multilingual writing in the disciplines. If writing centres want to change taking these multilingual writers for granted and start considering them as 'writers with agency' (Olson 2013: 2), they have to reorientate and negotiate, focusing on multilingualism as the base concept of their work. Of course one can only suggest concepts suitable for a certain context as the one mentioned in this paper suitable for the context of the Göttingen University where the premises and changing possibilities are known and applicable.

One important point which we very much strive to obtain through our research is creating the conditions necessary for writers to develop their own metacognitive writing strategies. Our target group, the natural sciences students, can apply their writing strategies by using their diverse language repertoires. However, before they reach these phases, they, as study beginners, have to fulfil certain discipline standards. Here is where our study creates a new path in this direction, by bringing these concepts together.

Overview of the Course 'Academic Writing for Natural Sciences Students'

The course 'Academic Writing for Natural Sciences Students' is offered for natural sciences study programmes and offers students the possibility to obtain credits in key competences, which are mandatory for all students. However, they are free to select the activities they want to attend. Thus, the participants in this course are interested in writing and are maybe already aware of their writing processes for scientific papers.

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2   For further details on limited resources and consequences on academic writing see Blommaert (2008), *Grassroots literacy: Writing, Identity and Voice in Central Africa*.

The course is an opportunity for students to get a deeper contact with a comparison of the Anglo-Saxon and German writing traditions, especially concerning the structure and language in papers, readers' orientation, rhetorical strategies, integration of citations in texts, precise description, results and discussion, patterns of argumentation and paragraph writing. Since the students are already experienced in academic writing in at least one language - mostly in German – the course addresses academic writing processes in a multilingual setting by elaborating writing strategies for realising translingual practice.

One of the exercises proposed during the course was the 'Guided Translingual Writing', which shows an example of how students could apply their translingual writing practice to enhance their multilingual writing competences and experiences. Based on Ruhmann's (2000) idea of a quick run through an academic writing process we added suggestions on how to integrate translingual practice in the writing process considering Lange's (2012) multilingual writing strategies for academic purposes and Canagarajah's (2011) suggestions for a pedagogy of code-meshing strategies.

The exercise takes into account different working phases during an academic writing process, e.g. planning, writing a draft, revising it (considering strategies as completing the content, for example), integrating a reader's orientation, regarding specific requirements of the discipline concerning language use and style. Students are encouraged to use all their language repertoires for their planning phase and for writing a first draft. Even while revising content and reader's orientation, students are invited to use the languages they prefer to express themselves in, changing to the target language only when starting revising the text on language use and style in order to avoid hybrid text forms in the end, which are not yet accepted in natural sciences. The exercise ends with peer feedback on the text elaborated within one hour work-time, while the students take notes on ideas for further writing. This exercise leads students to practice their multilingual writing and use the dynamic of languages as a thinking and writing tool. Due to restrictions in institutional acceptance of hybrid text forms, the writers change to a text written in the target language, either German or English, already during this exercise.

Methods

The background of this empirical study is a course offered to Bachelor and Master Students of natural sciences at Göttingen University in winter semester 2012/13. Participants are required to prove a good command of both German and English languages (≥ B2 CERF) in order to join the course and at the end of the term, they are granted 4 credits in key competences, as long as they participate in class and hand in a portfolio for the activity.

The corpus of this project constitutes of both portfolio activities and interviews. The entire data included in the study came from informants who consented in written form to be audio recorded.15 subjects produced portfolio activities, which include tasks in multilingual writing in the natural sciences. This way, the students were able to apply what was discussed in class; among which are the writing traditions in German and in English languages and giving and dealing with peer-feedback on written drafts. In addition to that, the portfolio tasks were developed to instigate students to reflect on their translingual writing process.

Four of those 15 students have been interviewed on the biographical information concerning their learning tradition and their attitudes towards multilingual academic writing. The problem-centred interviews were approximately 45 minutes long consisting of open questions and based on the structure-laying technique. These interviewing techniques offer the interviewed students the possibility to argue their individual attitudes and beliefs about their academic writing processes. The structure-laying technique was used to disclose subjective theories about individual attitudes (Scheele and Groeben 1988). Eventually, the interviews were transcribed and analysed using the content analysis method offered by Mayring (e.g. 2009; 2010).

The interview questions focused on the informants' position concerning the activation and potential of multilingual writing and revolved especially around the informants' linguistic and cultural backgrounds, their experience with academic writing and their writing style. For this paper, we focus on the interviews of the four informants. Where necessary, the informants' portfolio reflections accompanied the data collected from interviews. Based on this data, we developed inductive codes (see Table 1) concerning the informants'

attitudes and approach towards academic writing and multilingual resources. In this case, they deal with the two language resources, English and German.

Table 1: Inductive Codes and Definition

Inductive codes	Definition
Training in academic writing (English and German)	In the study programme academic writing or Scientific English courses are mandatory.
Acquired and applied academic text standards (English, German)	Informants use text requirements as a matrix for orientation.
Comparison of the two academic language sources, English and German	Informants compare the academic language systems English and German.
Multilingual writing practice	Informants describe their multilingual reading and writing strategies.
Language(s) use reflection	Informants are aware and mention their writing abilities and competencies during the writing process

Results

The four interviewed subjects were chosen as core part of this project, due to the fact that they have shown to be extremely different concerning their writing behaviour and their attitudes towards multilingualism. For the purpose of this research these informants were named Laurenz, Lara, Stella and Alex, and are introduced in Table 2 below.

Table 2: Informants' Background Information

Pseudonym	Information about the informants
Laurenz	Biodiversity and Ecology (Bachelor); raised in a bilingual context: British and German; native command of English and German
Lara	Biology (Bachelor); L1: German; L2: English (learned at school and university); L3: French
Stella	Biology (Bachelor); raised in a multilingual environment (Romanian, German, English); knows Italian, French, Spanish
Alex	Geology (Bachelor); L1: German; L2: English (learned at school and university; knows some French, Italian, Norwegian, Swedish, Spanish, Polish, Russian

Training in Academic Writing

The analysis of our data confirms what study programmes include: in the natural sciences, students do not learn academic writing in a course within the programme but have to practice various text forms to fulfil the requirement of their study programmes.

Concerning the informants' writing experience, it is restricted to essays and other academic assignments in English, as well as reports in German. However, students have to write German text types like protocols or reports during their studies, even if they are not offered enough instruction with respect to the production of texts in both academic languages. Learning to write academically in their experience means to try an academic writing style. The following interview excerpts reflect this reality faced by two of the interviewed students:

> Ach so, hauptsächlich hmm war das in Deutsch und hmm ja. (…) und das war hauptsächlich Referate, Protokolle zu Laborexperimenten oder Protokolle zur gelernten Übung, das konnten mal schon 20 Seiten sein (...) aber auch mit Diagrammen drin und Bildern, (…) Na ja, man hat nicht viel gelernt darüber, man hat das einfachgemacht, sage ich mal.
> well, it was basically in German, and hmmm yes. (…) and basically it was presentations, reports to laboratory experiments or reports to activities accomplished, and they could be as long as 20 pages

(...) but also with diagrams and pictures, but not so many, but... yes, and concerning the style, or the cultural background. Well, we don't learn anything, we just do it, I would say.

(Alex, concerning his writing biography in academic context, 00:06:00-3 to 00:07:21-6)

Some study programmes compel students to attend courses in Scientific English. These courses are offered by the language centre at the university and are not specialised for the various study programmes in natural sciences. Although the course 'Scientific English' is a component of the Biology study programme the content is not specially developed for this one subject. Therefore some students – like Stella – are not confident with the content, as they do not think that they could learn so much in the lessons.

> An der Uni hatte ich 'Scientific English', was jetzt nicht so vielgebracht hat meiner Meinung nach, aber es war eben Pflicht, weil ich nichts Neues dazu gelernt habe, ach so, gar nichts. Man hat irgendwie Texte gelesen und hat irgendwelche Aufgaben gemacht, aber ich habe mich jetzt nicht irgendwie weiter gebildet, würdeichsagen. Schriftlich mussten wir ein Essay schreiben wie eine oder zwei Seiten das war gar nicht so viel ach so und man hat natürlich das genommen, was man vorherschonkannte ach so ich hätte es wahrscheinlich davor genau das gleiche Essay geschrieben wie jetzt dann am Ende von dem Kurs. Auf Deutsch gar nichts.
> At the university we had the 'course Scientific English', which didn't bring me very much, as I see it, but it was mandatory, because I haven't learned anything new, I mean, nothing at all. We had to read some texts and hand in some assignments, but I haven't improved in any aspect, I would say. We had to write an essay, like one or two pages, that's it, not too much, and obviously we used what we already knew beforehand, I mean, probably I would have written the exact same essay I would now in the end of the course. In German, well, nothing at all.

(Stella, concerning her writing biography in academic context, 00:00:34-6 to 00:01:16-9)

During her mandatory English course Stella had to write an essay, but she sees no progression in her writing competency. Thus, the English language course did not offer the right assistance to improve her academic writing competence. What Stella does not mention in her interview is the text type: writing essays and getting knowledge about the text structure and the paragraph writing structure could be helpful for an argumentation in protocols, papers or reviews, the main text types in natural sciences.

Acquired and applied text standards

All four interviewed students mentioned text formats like AIMRaD, paragraph structure or academic standard phrases for describing the methods or results in the target language as helpful for organising and practising their academic writing process. Regardless of the target language, the informants apply AIMRaD or information about possible ways of argumentation order in methods as orientation for their own planning process. They use this information to sort various objectives in order to decide in which chapter and in which order the arguments can occur. Writers choose academic standard phrases, e.g. to present the results, because they feel sure about using correct academic language and to be sure that readers will understand sentences in the author's intended way. Even more, standard phrases help in getting started with the writing activity.

Comparison of the two academic language sources

The informants also reflect on the different writing traditions in English and in German. Lara, for example, is drawn to the conclusion in the Portfolio reflections that texts are comparatively different in size and quality, as well as word choice and fluency in general. Laurenz, on the other hand, manifests surprise when comparing his text production in both languages, since he realised there are many more similarities than differences, be it concerning the sentence size, number of sentences in a paragraph, the integration of citations and paraphrase and use of passive in essays. According to the interviews, he asserts the following:

> I hmmm I feel that I can actually transport the same subject matter in a way that is very very similar in both languages if I try (...)
> when I was engaged in writing similar texts in both languages I was thinking more about both languages and what I found easier and more difficult in one or the other (...)

and then actually seeing when do I feel that a text is awkward or not getting the point across and how I can modify it... I haven't done that very much before (Laurenz, 00:34:29-0 to 00:38:19-0)

Language(s) use reflection

When reflecting on his activation of his multilingual repertoire, Laurenz emphasizes the transparency he would like to bring along through his texts. This probably happens because he has his potential reader in mind and guides himself to this reader. Also, he seems to be quite aware of the impact of his repertoires and language use. In this respect, he says in the interview:

> I this maybe something which is particular to me, but when writing German and English, and especially when I attempt to make both languages as transparent as the English language it seems to be the use of logical modifiers for example (Laurenz, 00:33:56-4)

Multilingual writing practice

Through the analysis of the interview, Laurenz made himself reflect about his language repertoire and how he can activate and apply it productively through his writing process. This way he can achieve what he considers as being a text of a higher quality in the end. This reflection-oriented process was unknown to him before the course; however, he sees the potential it can offer for his future writing projects:

> I would say that what I actually... well... I... we receive very little instruction as to how to make use of the multilingual situation (…)
>
> what I do is... when writing in both languages... I actually what I am actually doing and this maybe a bad thing is trying to fill hmm the other language and concentrate entirely on the peculiarities and the structure of the one language just the one which I am writing in (Laurenz, 00:14:19-3)

To sum up, Laurenz developed his metacognitive strategies by transferring components from language A to language B, as it is the case of 'logical modifiers' as shown in the example above. When asked about her writing process, Stella shows that she is aware and makes use of multilingualism as a resource, even when she cannot explain how she has started doing it:

> Ja, ach so wenn ich habe eigentlich kein Problem damit, eben was zu übersetzen, ach so wenn ich jetzt irgendwie ein Text auf Englisch habe dann mache ich mir Stichpunkte auf Englisch und übersetze es dann aufs Deutsch oder mache mir zweisprachige Stichpunkte auch ganz oft, wenn mir schon während dem Lesen schon irgendwie eine gute Formulierung auf Deutsch einfällt, dann schreibe ich die eben auf hmm ach so ich benutze es einfach beides. Das mache ich, und ja, ich würde schon sagen es ist positiv. Ach so, ich brauche eigentlich nicht lang einen Satz irgendwie zu übersetzen oder so, ich lasse einfach direkt beide Sprachen einfließen, so klar natürlich, der End-Text ist natürlich dann Deutsch in meinem Fall jetzt, aber ich habe eigentlich kein Problem mit englischen Sachen, das war ach so mir jetzt im Studium aufgefallen, weil ich halt ach so wenn ich mich Stichpunkte mache eben zweisprachige teilweise Stichpunkte immer, ich weiß es nicht an was das liegt, keine Ahnung. Vielleicht weil ich mehrsprachig aufgewachsen bin, keine Ahnung
>
> So, I have no problem at all with translating things, so, if I am reading a text in English and I take notes in English and translate into German or I take notes in two languages also very frequently, when hmm during the reading already somehow I think of a good sentence in German, then I write it down hmm so I just use both languages. That is what I do, and yes, I would say it is positive. So, it doesn't take me long to translate a sentence or so, I just let both languages flow, and obviously the final text is of course in German in my case, Maybe it is because I grew up in a multilingual environment, no idea. (Stella, 00:06:29-9 to 00:07:36-2)

Stella, who grew up with several languages, uses multilingual writing strategies flexibly. Depending on the language of her scientific literature or the ideas coming into her mind she practises writing strategies like translating and spontaneous multilingual writing. She is confident about her multilingual writing process and seems to easily reach an academic text in the target language German.

Differently from the first two informants, Lara sees multilingualism as a deficiency and feels that it disturbs her writing, since it is difficult for her to have the different languages influence her thinking about a text's content and about expressing it in a target language. She describes herself as having many ideas in mind,

which are difficult to articulate be it concerning the argumentation or for lack of idiomatic expressions, since she keeps switching between the codes. She seems to be so concerned about expressing herself appropriately and has the idea of language fixity and product-oriented correctness. Lara seems to be more engaged in looking for the right expressions and formal correctness of language than realising the objectives she wants to express through her writing:

> und... hmm... ach so... mich stört die Mehrsprachigkeit beim Schreiben tatsächlich ja
> Multilingualism disturbs my writing indeed (Lara, 00:04:00-5)

> aber es fällt mir schwerer, weil ich dann zwischen den Sprachen hin und herspringe
> but I find it difficult, cause I keep switching between the languages (Lara, 00:04:14-1)

> und mich nicht gut ausdrücken kann
> and cannot express myself well(Lara, 00:04:17-4)

Lara is an example that the exercise of multilingual writing is no common practice in the German university context. However, during the course she was offered support to experience a new possibility:

> Durch den Workshop habe ich aber anderes Schreiben kennen gelernt, was mir durchaus gefallen hat. Besonders gut hat mir da der „Schnelldurchlauf" gefallen. Dies werde ich zukünftig öfter verwenden und üben, da es mir so durchaus Spaß macht und ich das Gefühl habe, dass der Text an Qualität dazu gewinnt.

> During the course I have got contact with a different writing, which I liked. Especially good was the exercise 'guided translingual writing'. That I will use more often in the future, because it is fun, and I have the feeling that the text's quality is higher.
> (Lara, Portfolio task WS 2012/2013)

Lara seems to use relatively fixed cognitive strategies, which were made available to her only by means of the course. After working on her reflections she is now able to organise her writing process and integrate these new strategies to it consciously. Due to the fact that she was in contact with a different kind of writing strategy – especially the exercise 'guided translingual writing' – she finds a way to deal with her writing process on an emotional level, which differs totally from her previous writing. The exercise opens up new perspectives concerning her multilingual writing process: By using multilingual writing as a strategy for her writing she is able to create a text expressing her ideas and intentions in a way she feels confident with. As she practised the suggested writing phases she gained more conscious about her writing process and receives knowledge of how to integrate her competencies in the two languages German and English, achieving cognitive development of her writing strategies.

Discussion

The present paper supports and makes use of Canagarajah's theoretical approach of *translingual practice* and has used it to define the fundamental theory and the aim of this project for the scientific writing in the natural sciences. The purpose of the study was to analyse the situation of multiliteracy of natural sciences students in their academic writing in order to develop didactical suggestions according to the findings for multilingual scientific competence. As seen throughout the entire paper, the scientific context of natural science at the Göttingen University deals with a range of monolingual-oriented concepts, which are reflected in the students' perspective on academic writing. There is a certain experience with writing in general available, which plays an important role in their perception and attitude towards writing. A point worth opening to discussion would be to what extent the context in which they receive their academic instruction allows, restricts or influences their attitude towards their use of multilingual competence and on a

metacognitive level their hybrid background which is made up of a diversity of languages and thinking systems.

Our didactical suggestions grow out of the idea mentioned above because the conditions of such a context determine the academic behaviour of such multilingual individuals. We observed the following:

1. the training possibilities and the academic writing courses failed in our informants' case to meet their needs
2. being taught standard academic writing is definitely a starting point for training academic writing skills; however, it is not sufficient for more complex tasks and rather inappropriate for developing a personal scientific writing style
3. the constant comparison between the two language resources (English and German) is based on rigid language stereotyping structures, standard language constructs and canonical grammar issues
4. language reflection takes place on the word level and it refers to conscious language use within the writing process
5. multilingual writing practice varies from one informant to another, from target language orientation to translation, from one language resource to another, and from conscious use of multilingual competence to strong differentiation splitting between one's available language resources.

The above mentioned results lead us to the didactic suggestions for achieving awareness of learners' available language resources and repertoires. Also, the self-documentation and reflection on usages of languages for different academic writing purposes should be supported. As Canagarajah, who does not exclude standardisation and institutional concepts of scientific writing in his translingual practice, we as well try to connect institutional requirements with individual resources and necessities in acquiring translingual practice in scientific writing in natural sciences.

This study was not conducted without limitations, both on the structure and content level. The first limitation involves the bilingual situation of the informants, which points at a rather narrow approach to multilingualism. In addition to that, the background of the informants being relatively homogenous did not leave a significant impact on the collected data. Methodologically, we assigned five inductive codes, which should support a better understanding of the data and relevant analysis of the results. These were drawn strictly out of the informants' data and statements. However, for developing main categories in multilingual scientific writing, we need a broader and larger set of data as well as a longer research period. What we have described here is a first attempt at analysing a context, which is very rich in resources that multilingual academic writing needs.

Developing didactic suggestions for multilingual writing in the natural sciences is challenging, since so far this concept is relatively unknown for students and probably for scientists in these disciplines. There seems to be a gap between focusing on fulfilling text conventions, on the one hand, and writing multilingually, on the other hand. Therefore, our focus in the next research phases is to bridge this gap in a constructive way which should not exclude the reality and presence of standards in language use in an academic context nor should it ignore the diverse background of the individuals involved in it.

The next step of our research project will, therefore, focus on interviews with natural sciences scholars in order to develop empirically based didactic suggestions for multilingual writing considering both perspectives of students and scientists.

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