

From multidisciplinary to transdisciplinarity: The investigation of competence development as a case in point

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Abstract

In this article, the concept of multidisciplinary is contrasted with two closely related concepts, interdisciplinarity and transdisciplinarity, following a sub-classification by Kaindl (1999). On this basis, the article discusses the chances of a specific subfield of translation studies, research into competence development, to work in a truly transdisciplinary manner. As a case in point, results of the longitudinal study TransComp are presented. It investigates the development of translation competence in students of translation over a period of three years and compares their translation behavior to that of ten professional translators. In this study, translation competence was modeled as composed of several sub-competencies, among them strategic competence, translation routine activation competence and tools and research competence. These three sub-competencies were considered to be translation-specific and to distinguish professional translators from mere bilinguals, and were therefore selected as the dependent variables in the study. The professional translators were found to have not yet achieved expertise, the highest level of competence. The student participants' competence development stagnated with regard to several variables over the first four semesters of their program. For these findings, possible explanations and their didactic implications are presented.

Keywords: multidisciplinary, interdisciplinarity, transdisciplinarity, competence development, expertise research, longitudinal studies, process-oriented research

1 Introduction

The present article starts out by addressing the question “Multidisciplinary – what is it?”, which formed the title of the IXth Symposium on Translation and Interpreting at the University of Eastern Finland in April 2011. This question is answered by contrasting the concept of multidisciplinary with two closely related concepts, interdisciplinarity and transdisciplinarity, following a sub-classification by Kaindl (1999). With regard to these three concepts, which differ in the intensity of cooperation and interaction between disciplines, translation studies is classified as a discipline that has moved from the level of multidisciplinary to the level of interdisciplinarity. For a specific area of translation studies, i.e. the investigation of the development of translation competence to its highest level, the level of translational expertise¹, the article shows how it can enter into a transdisciplinary relationship with expertise research in cognitive psychology. It outlines in what manner translation studies can draw on findings in expertise research and in what way results of empirical investigations of the development of translation competence can

flow back into expertise research. This is illustrated by methodological approaches and findings of the longitudinal study TransComp.

TransComp investigates the development of translation competence of 12 students of translation in the bachelor's program "Transcultural Communication" at the Department of Translation Studies of the University of Graz over a period of 3 years (2008–2011) and compares their translation products and processes to those of 10 professional translators (for details, see Göpferich 2009). The students' mother tongue was German, their first foreign language (L2) at school and in their bachelor's program was English. The 10 professional translators all held university degrees in Translation Studies, German and English being among their working languages, and they had at least 10 years of professional experience as translators/interpreters.

The 12 student participants and 10 professional translators were subdivided into two groups of 6 and 5 participants respectively (see Table 1 and Table 2). Each student had to translate 10 English texts (eight extracts from popular-science texts and two extracts from operating instructions texts for household appliances) into German according to the schedule in Table 1. As shown in Table 2, half of the professional translators had to translate Texts A1 to A5, the other half, Texts B1 to B5.

Table 1. Translation schedule for students²

	Group A (6 students: BKR, KNI, SFR, HHE, TDI, CHA)	Group B (6 students: EVE, JZE, JTH, MLE, STO, THI)
Beginning of 1st semester	Text A1, Text A2, Text A3	Text B1, Text B2, Text B3
Beginning of 2nd semester	Text A4, Text A5 Text B1 (1 semester lag)	Text B4, Text B5 Text A1 (1 semester lag)
Beginning of 3rd semester	Text B2 (2 semesters lag)	Text A2 (2 semesters lag)
Beginning of 4th semester	Text B3 (3 semesters lag)	Text A3 (3 semesters lag)
Beginning of 5th semester	Text B4 (3 semesters lag)	Text A4 (3 semesters lag)
Beginning of 6th semester	Text B5 (4 semesters lag)	Text A5 (4 semesters lag)
End of 6th semester	Text A1 (6 semesters lag)	Text B1 (6 semesters lag)

Table 2. Translation schedule for professional translators

Group A (5 professional translators: KEG, LEB, RAN, AIR, AEF)	Group B (5 professional translators: CAS, FLS, GEM, GOB, RCH)
Text A1, Text A2, Text A3, Text A4, Text A5	Text B1, Text B2, Text B3, Text B4, Text B5

The source texts (STs) selected provide a range of different translation problems. Comprehension of the STs did not require any specialist knowledge. The texts were chosen because they are easy to understand, but difficult to transfer into the target language.³ They were translated using Translog, which registers all keystrokes, mouse

clicks, and the time intervals between them. To guarantee ecological validity of the experiments, the participants were allowed to use the Internet as well as any other electronic and conventional resources they desired. Use of electronic resources was registered using the screen-recording software Camtasia Studio; use of conventional resources was documented by observers. During the experiments, the participants were required to think aloud (level 1 and 2 verbalizations according to Ericsson/Simon 1993: 79). They had been trained in this procedure during a trial session prior to the first experiment and had acquired some experience in at least two other experiments prior to the ones reported in this article. The participants' process of thinking aloud and other activities (consultation of external resources, reading the assignment, drinking, etc.) were transcribed in 'translation process protocols' (TPPs) using XML mark-up (Göpferich 2010a). Immediately after the experiments had ended, all participants were required to complete a questionnaire on how they had felt during the translation process, on the problems they had encountered, and the extent to which they were satisfied with their results. In addition, they were asked to rate the difficulty of the STs on a scale from 1 ('very easy') to 5 ('very difficult').

Apart from the think-aloud and the participants' activities mentioned above, occurrences of translation problems were also encoded in the TPPs as an interpretation category. To determine which parts of the participants' transcripts constituted instances of translation problems, an adapted version of Krings's (1986: 121) classification of problem indicators was used (for details, see Göpferich 2010b: 8 f.)

With regard to TransComp, the paper focuses on the methodological approaches and findings concerning the development of those three sub-competencies of translation competence that, in the TransComp project, were considered translation-specific, i.e., that do not automatically result from bilingualism: strategic competence; translation routine activation competence; and decision making as an aspect of tools and research competence. The paper thus brings together results obtained by three researchers involved in the TransComp project: Susanne Göpferich as the project leader of TransComp, and Gerrit Bayer-Hohenwarter and Friedrike Prassl whose PhD projects on translational creativity and tools and research competence respectively form part of the TransComp project.

2 Multidisciplinarity, interdisciplinarity and transdisciplinarity

Kaindl (1999) makes a distinction between three forms of cooperation and interaction between disciplines, which he designates multidisciplinary, interdisciplinarity and transdisciplinarity. He depicts their relationship as illustrated in Figure 1, in which the intensity of cooperation and interaction increases from the bottom to the top.

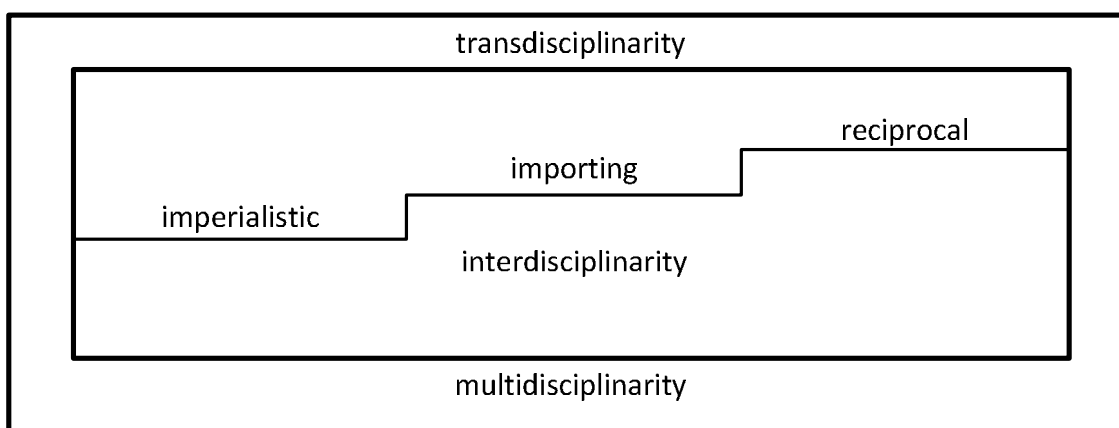


Figure 1. Cooperation across disciplinary boundaries (according to Kaindl 1999: 143; my transl.)

‘Multidisciplinarity’ (or ‘pluridisciplinarity’) designates the mere co-existence of disciplines which share an object of interest and investigate it from their disciplinary perspectives without integrating their insights into a common framework (Kaindl 1999: 142; cf. however Thome 2004: 7). With regard to translation, this co-existence of disciplines interested in the object of translation was what prevailed until the 1980s.

According to Kaindl (1999: 143), multidisciplinary constitutes the weakest form of cooperation (or no cooperation) between disciplines, while transdisciplinarity constitutes the closest form which, among other things, is characterized by its systemic character and the integration of insights into a coherent system of knowledge. Transdisciplinarity thus is a form of cooperation which has not yet been achieved in translation studies and which, perhaps, will never be achieved.

The form of cooperation that has been achieved in translation studies is interdisciplinarity. With regard to this form of cooperation, Kaindl again differentiates three degrees or stages: ‘imperialistic interdisciplinarity’, ‘importing interdisciplinarity’ and ‘reciprocal interdisciplinarity’. At the stage of imperialistic interdisciplinarity, “one discipline is constitutive for the development of another discipline” (Luyten 1974: 151; my transl.). Kaindl (1999: 146) states that this form of cooperation dominated translation studies until the 1980s. Until then linguistics imposed (“überstülpen”) its methods and theories upon translation studies, which led to its desire to emancipate (“Abnabelung”) itself from it (Kaindl 1999: 146; cf. also Neubert 1997: 9). Although, in principle, I agree with Kaindl, I would not speak of ‘imposition’ here and, following Gisela Thome (2004: 11), do not believe that translation studies can or should ever emancipate itself from linguistics since it cannot be denied that translation always has something to do with language.

The next stage of interdisciplinarity is importing interdisciplinarity. With reference to Wallner (1993: 17), Kaindl describes it as a form of cooperation where one discipline

uses concepts, methods and theories from another discipline to gain deeper insights within its own field but without giving anything back to the 'donor' discipline (Kaindl 1999: 147). This is the stage that translation studies as an interdiscipline has reached today in most of its subfields (Snell-Hornby/Pöchhacker/Kaindl 1994).

The closest form of interdisciplinary cooperation, however, is reciprocal interdisciplinarity. In this form of cooperation, two or more disciplines collaborate as equal partners. For tackling their joint research question, theoretical and methodological concepts are developed jointly and combined in a systemic manner. The findings that this type of research yields provide insights and scientific progress for all disciplines involved in reciprocal interdisciplinarity (Kaindl 1999: 147). Thus, the concept of reciprocal interdisciplinarity seems to come close to what Kaindl calls transdisciplinarity. The only distinguishing feature that I can find in his description is that transdisciplinarity, in contrast to reciprocal interdisciplinarity, seems to involve disciplines from completely different scientific areas such as the humanities and the natural sciences (Hübenthal 1991: 92). If we ignore the closeness or remoteness of the disciplines cooperating, which is hard to determine anyway, we can consider transdisciplinarity and reciprocal interdisciplinarity as synonyms. As mentioned above, translation studies has not yet reached the stage of reciprocal interdisciplinarity with other disciplines. It is more a borrower than a lender of concepts, methods and theories. The disciplines that it has borrowed from are cultural studies, psychology, sociology, ethology, information science, history, to name just a few important ones, and of course, linguistics and literary studies from which it 'emancipated' itself in the 1980s.

Whenever there is a phenomenon of high interest, such as translation after World War II, that can no longer be explained exhaustively within the confines of one discipline, such as translation within the disciplines of linguistics or literary studies, it may spin off and lead to the establishment of a new area of research stretching out its arms for partners from other disciplines who may contribute to the exploration of the phenomenon it has in focus. One such area that has experienced a considerable increase in interest in translation studies and all pedagogical disciplines, such as the teaching of foreign languages and soft skills, is competence development and how it can be measured or assessed. Just as translation studies spun off as a discipline or rather interdiscipline of its own in the 1980s, research into competence development may also spin off from its source disciplines as a research area of its own. In this particular case, however, there already exists a field of research that may accommodate the multidisciplinary interest in competence development: expertise research within cognitive psychology. It focuses on what distinguishes experts in various domains, i.e. persons who have achieved the highest stage of competence in their specific domains of specialization.

The competence or expertise of a specific person is always limited to a field of practice or domain. For expertise research within cognitive psychology, this means a dependence on 'donor' disciplines, such as, for example, translation studies in which translation competence and how it develops is investigated. The analysis of expertise in various

fields, such as playing chess, interpreting X-ray images, taxi driving and many others, has shown that, although expertise is domain-dependent, its development follows similar paths cognitively no matter what domain is involved so that we are on a way *Toward a General Theory of Expertise*, as the title of a volume edited by K. Anders Ericsson and Jacqui Smith in 1991 indicates. On the one hand, developing a general theory of expertise needs input from various disciplines, among them translation studies. On the other hand, however, the investigation of competence development in various domains, such as translation, also benefits from the insights that have been collected and integrated into a common framework in expertise research. For translation studies this means that competence development towards expertise is an area of research where true reciprocal interdisciplinarity or transdisciplinarity as a give and take between itself, translation studies, and expertise research may come about.

What is it that expertise research has found out about the characteristics that distinguish an expert as a person who has acquired expertise in a domain from a person who has not yet achieved this highest level of competence?

- Experts' performance in their domain is continuously – and not only in individual cases – outstanding (Ericsson/Smith 1991: 2).
- Experts are able to solve highly complex problems within their domain (Risku 1998: 89).
- Experts do not only possess a large amount of knowledge in their specialized domain, this knowledge has also been restructured and interconnected to a higher degree in the process of its acquisition; experts possess superior analytical and creative as well as practical skills; their mental processes have been automatized to a higher degree (Sternberg 1997).
- The high degree of interconnection of knowledge in their long-term memories allows experts to retrieve it more quickly and with more precision and to overcome limitations of their working memories (Ericsson/Charness 1997: 15 f.). Being able to take many aspects into account, they can plan well in advance and defend their decisions (Ericsson/Smith 1991: 25 f.).
- According to Anderson (1990: 267 ff.), experts have transformed declarative knowledge in their domain of specialization into procedural knowledge (“proceduralization”); they learn tactically, i.e., they store and automatize sequences of actions and strategies they need for problem solving in their domain, as well as strategically, i.e., they have learnt how to solve problems in their domain most efficiently. Complex mental problem representations help them in doing so (Anderson 1990: 267 ff.).

These are characteristics that experts from various domains share. As a consequence, translation experts can also be expected to possess them. In TransComp, professional translators with 10 years of experience in the domain of translation had been expected to show these characteristics and thus to have acquired the competence level of expertise. As some of the findings, which will be presented in the following, show, however, this was not the case. Reasons for this will be provided in Section 5. If we want to determine

whether a person has acquired a certain level of competence or even expertise in a domain, we need instruments to measure competence. The following sections describe how specific sub-competencies of translation competence were ‘measured’ in TransComp.

3 How can translation competence be ‘measured’?

A prerequisite for a differentiated process-oriented assessment of translation competence is that we know the variables in which translation processes of highly competent translators differ from those of less competent translators at different stages of their training or development. In order to be able to develop a yardstick that can be used in a process-oriented assessment of the competence level that a person has acquired, we need longitudinal studies in which typical features of the translation processes of the same persons can be determined over a longer period of time (e.g. the duration of a bachelor’s or master’s program and beyond) at regular intervals (e.g. once a semester). One of the few studies that fulfill these requirements is the longitudinal study TransComp (Göpferich 2009). It models translation competence as depicted in Figure 2.

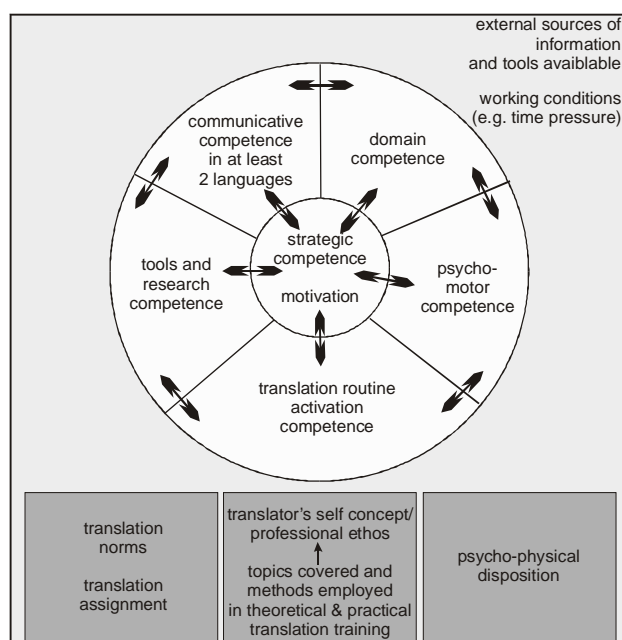


Figure 2. Translation competence model (Göpferich 2009: 20)

TransComp focuses on the development of those sub-competencies that are assumed to be specific of professional translation competence and do not play a role, or only a minor role, in bilingualism. These sub-competencies are translation routine activation competence, tools and research competence and, above all, strategic competence. They are assumed to be the specific sub-competencies that distinguish highly competent

translators from persons without any translation-specific training. In TransComp, they were therefore selected as dependent variables.

Tools and research competence comprises the ability to use translation-specific conventional and electronic resources and tools. Translation routine activation competence comprises the knowledge and the abilities to recall and apply certain – mostly language-pair-specific – (standard) transfer operations (or shifts) which frequently lead to acceptable target-language equivalents, for example, transferring English gerunds and participle constructions into German subordinate clauses. Strategic competence controls the employment of the sub-competencies mentioned above. As a meta-cognitive competence it sets priorities and defines hierarchies between the individual sub-competencies, leads to the development of a macro-strategy in the sense of Hönig (1995), and ideally subjects all decisions to this macro-strategy. How strictly translators adhere to employing this macro-strategy depends on their strategic competence and their situation-specific motivation, which may be both intrinsic (enjoying translating), or extrinsic (payment, fear of compensatory damages, etc.).

4 Data analysis and results

For each of the three variables of translation competence, 1. strategic competence, 2. translation routine activation competence and 3. tools and research competence, indicators were specified by means of which it was determined to what extent the participants betrayed the respective sub-competence. This article cannot cover them all. Therefore, I will confine myself to a selection of them. One of them is the degree to which the participants proceeded in a strategic manner.

4.1 Strategic competence

In TransComp, the term strategic is defined to refer to processes in which a participant was aware of, or (systematically) developed an awareness of, the criteria that a specific target text (TT) section has to fulfil in order to be an adequate correspondent for the respective ST unit. Proceeding in a strategic manner can thus be regarded as the opposite of guessing, to which participants frequently resort when they are not aware of the criteria to be fulfilled by an adequate TT version. The degree to which participants proceed in a strategic manner, and thus avoid guessing, is regarded as one indicator of strategic competence.

To gain insight into the degree to which the participants proceeded in a strategic manner, the steps taken and reflections made by the participants when solving a selection of problems as identified by the indicators referred to in Section 1 were analyzed. In the following, I will concentrate on one such problematic source text segment from an operating instructions manual of a hand mixer. One group of students had to translate this text at the beginning of their first semester, the other group of students, at the beginning of their fourth semester. In addition, it was translated by one group of the

professional translators. The source-text segment was chosen because it represented a translation problem in the sense defined above for 13 of the 16 participants who had to translate it, among them four of the five professional translators. The problematic source-text segment is the term *control switch* in the instruction “Check that control switch D is in position 0 ...”.

Three out of 5 professional translators, 1 out of 5 4th-semester students and 4 out of 6 novices produced acceptable solutions. To determine how these solutions were found, the participants’ problem-solving paths, as documented in their TPPs, were subdivided into individual steps. Table 3 shows the problem-solving paths of two participants. Plus signs (+) in the right-hand column indicate useful and goal-oriented measures and decisions; minus signs (–) indicate measures which are not useful, not goal-oriented, or wrong decisions; and zero signs (0) indicate decisions which may make sense to a certain extent but do not take into account everything that is relevant; or decisions which are difficult to define as goal-oriented, i.e., positive, or not, i.e. negative. These problem-solving paths shed light on the way in which the participants did, or did not, proceed in an efficient and goal-oriented manner guided by an awareness of the criteria by means of which potential renderings can be evaluated as adequate or inadequate. We can thus conclude to what extent an adequate rendering in the TT can be regarded as a matter of mere chance, and therefore not as an indicator of translation competence, or as the result of strategic behavior guided by criteria used consciously by the participants in their problem-solving processes. Both participants produced acceptable solutions, but, as their problem-solving paths show, only the professional translator KEG proceeded in a highly strategic manner whereas the novice KNI’s solution seems to have come about by chance.

Table 3. Problem-solving paths for two translators who both produced an acceptable solution for the translation problem ‘control switch’

Participant	Problem-solving path
KEG (professional translator)	<p>utters the goal to designate the switch according to its function (+); to find out the function of the switch, wants to have the mixer at his disposal (+); concludes from the cotext (probably from “With the control switch (D) on 0, the attachments can be removed ...”) that it must be an ON/OFF-switch (<i>Hauptschalter</i>), so that the function is clear and the comprehension problem solved (+); rendering, however, is postponed; discovers the information “Speeds selected with control switch” in the cotext provided which did not have to be translated, and correctly concludes that there is only one switch, which he then simply calls <i>Schalter</i> (switch), which solves the production problem (+) (strategic)</p>
KNI (1st-semester student)	<p>searching for a common German term for <i>control switch</i>, she spontaneously associates <i>Kontrollknopf</i> and <i>Hauptschalter</i>, of which she prefers <i>Hauptschalter</i> (0);</p>

	looks up <i>control switch</i> in the bilingual online dictionary <i>Leo</i> , in which she reads various potential equivalents, among them <i>Hauptschalter</i> , by which she feels confirmed in her preferences although this designation does not sound good in her opinion (-); participant ignores her personal preferences arguing that the fact that something sounds good or not is not a relevant criterion here (+) (strategic behavior undetermined, see below)
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To objectify these impressions, it would have been desirable to find a method of quantifying the degree to which the participants proceeded in a strategic manner. Three possible approaches were contemplated: a) determine the percentage of strategic steps taken in the whole problem-solving path, b) determine the number of different problem-solving criteria used by the participants that coincided with those that an ideal translator would have used; and c) determine the percentage of steps that were evaluated as non-goal directed (-) because these can be considered an indicator of (in-)efficiency – the higher their percentage, the less efficient the translation process. In practice, however, the approaches were not applicable for the following reasons: a) the participants needed different numbers of steps to come to a conclusion, and not every step left a trace in the TPPs; results were therefore not comparable on a purely numerical basis; b) it cannot be assumed that the participants utter all the criteria they take into account. In extreme cases, a translator may produce an adequate translation without uttering any intermediate considerations. In this case, a translator would be awarded no plus points according to approach b) although s/he may have taken into account all relevant criteria. Certain inefficient considerations may also leave no trace in the TPP, so that determining their percentage is no feasible method either. Qualitative assessment was therefore carried out using the following criteria:

- a) Problem-solving paths which led to an acceptable solution and contained more positive (+) steps (at least one) than negative (-) steps or as many positive as negative steps were classified as strategic.
- b) Problem-solving paths which led to an acceptable solution and which contained either no positive steps or more negative or neutral ones than positive ones were classified as indeterminable.
- c) Problem-solving paths which led to an unacceptable solution but contained more positive steps (at least one) than negative steps or at least as many positive as negative steps were classified as indeterminable.
- d) Problem-solving paths which led to an unacceptable solution and contained either no positive steps or more negative and neutral steps than positive ones were classified as not strategic.

The results obtained for the three groups of participants for the translation problem *control switch* were as follows:

Table 4. Strategic behavior reflected in problem-solving paths for ‘control switch’

	Strategic	Indeterminable	Not strategic
Novices	33,3%	50,0%	16,7%
4th-semester students	0,0%	40,0%	60,0%
Students (novices + 4th-sem. students)	18,2%	45,5%	36,4%
Professional translators	40,0%	60,0%	0,0%

Table 4 shows that a comparison of the novices’ and 4th-semester students’ behavior does not reflect an increase in strategic behavior. If we take the novices’ and 4th-semester students’ results together and compare them with those of the professional translators, strategic behavior does not dominate in students’ problem-solving processes whereas in the professional translators’ processes, it does. The data collection on which this finding is based is much too small to allow for a generalization of the results. What is interesting, however, is that with regard to other indicators similar observations can be made: There seems to be no positive development in several components of the students’ translation competence from their first to their fourth semester.

4.2 Translation routine activation competence

Within the TransComp project, Gerrit Bayer-Hohenwarter (2011) has investigated the development of translational creativity, which she considers the counterpart of translation routine. Her hypothesis, which is confirmed by her analyses, is that translational creativity is competence-dependent. Increasing translation competence, which is accompanied by increasing routine, releases cognitive resources for more demanding processes, such as creative ones (Bayer-Hohenwarter 2011: 125). As a consequence, creativity can be assumed to increase in the course of the students’ training, if training leads to an increase in competence. Findings from expertise research in cognitive psychology also lead us to assume that competent translators use their cognitive resources in a more economic manner and are thus able to switch between a routine mode of translation and a creative mode of translation efficiently. More specifically, it can be assumed that they activate a creative mode only in situations where it is really needed, or, if they activate it for the translation of units which allow routine or standard translations, its activation does not involve much cognitive effort. From this it follows that certain forms of behavior, which have to be classified as creative in novices, should have become routine in professionals. Novices can be expected to have to become creative, and thus to invest a lot of cognitive effort, even for the translation of units which experts can translate in a routine mode. On the other hand, their creativity can be expected to lag behind that of professional translators when units require much creativity (Bayer-Hohenwarter 2011: 125 ff.).

In order to test these hypotheses, routine and creativity need to be made ‘measurable’. For this purpose, Bayer-Hohenwarter has developed a complex procedure whose basic principles will be presented in what follows. Following the father of creativity research, Joy Paul Guilford (1950), she considers creativity a multidimensional construct. Out of

the nine creativity dimensions Guilford distinguishes, she selects the three dimensions which are generally considered the prototypical characteristics of creativity. Apart from acceptability these are flexibility, novelty and fluency.

In Bayer-Hohenwarter's analyses, acceptability refers to the skopos-adequacy of the translations, i.e. to their adequacy with regard to functionalist criteria. Novelty refers to the rareness or uniqueness of a translation solution found. It is operationalized as a relative concept, i.e. the higher the novelty score of a solution is the less other participants have chosen the same solution. Flexibility refers to the ability to depart from the surface structure of the ST. The creativity dimension of fluency is set apart from the other three creativity dimensions and attributed to routine because fluency refers to the speed at which a solution can be found, and high speed is characteristic of routine behavior. For each of these four dimensions, Bayer-Hohenwarter defines indicators. In the following, some of these indicators will be explained in an exemplary manner. The most important indicator of flexibility are cognitive shifts, of which only the primary shifts will be explained. Bayer-Hohenwarter distinguishes three types: abstractions, modifications and concretizations in relation to the ST. For each shift a translator produces one bonus point is awarded. This does not only apply to the final versions a translator produces (product creativity) but also to all his or her interim versions as documented in their translation process protocols (process creativity). For a shift in the final product, in contrast to the interim versions, however, a bonus point is awarded only if the solution is acceptable. For the non-creative counterparts of shifts, i.e. reproductions, no bonus points are awarded.

Whereas shifts can be detected both at the product and at the process level, other indicators, such as fluency, only occur at one level. Roughly speaking, fluency measures the time needed by the translator to come to a solution after having read a ST unit. Bonus points for fluency are awarded for high translation speeds. In a similar manner, bonus points are awarded for instances to which the other indicators of translational creativity point. In this manner, values are obtained for fluency (routine) on the one hand and creativity on the other hand.

Due to its complexity, this method of analysis cannot be applied to whole texts but only to a selection of translation units. Gerrit Bayer-Hohenwarter analyzed four translation units per text. Since each translation unit may have a different potential for creativity and routine, and comparability between translation units and texts is a requirement, Bayer-Hohenwarter applies a normalization procedure. The highest value that a participant achieved in each dimension for each unit is transformed to 100% and the lower values are transformed to lower values accordingly. To determine the overall creativity of each participant, the percentages each participant achieved in all creativity dimensions are added up. The highest overall value that a participant achieved is then again transformed to 100% and the lower values to lower percentages accordingly. In this way, Bayer-Hohenwarter calculates average creativity scores (between 0 and 100%) and routine scores (between 0 and 100%) for each participant in each semester and sets them in

relation to each other in creativity-routine-profiles as shown in Figure 3.

In these profiles, each dot represents the creativity-routine score for one participant in the respective semester and one text. The profiles for the first and second semesters (t1 and t2) contain more dots because in these semesters each participant had to translate three (A1, A2, A3 or B1, B2, B3) and two texts (A4 and B1 or B4 and A1) respectively.⁴ The square in the profiles indicates the average value for all participants and all texts that had to be translated in the respective semester.

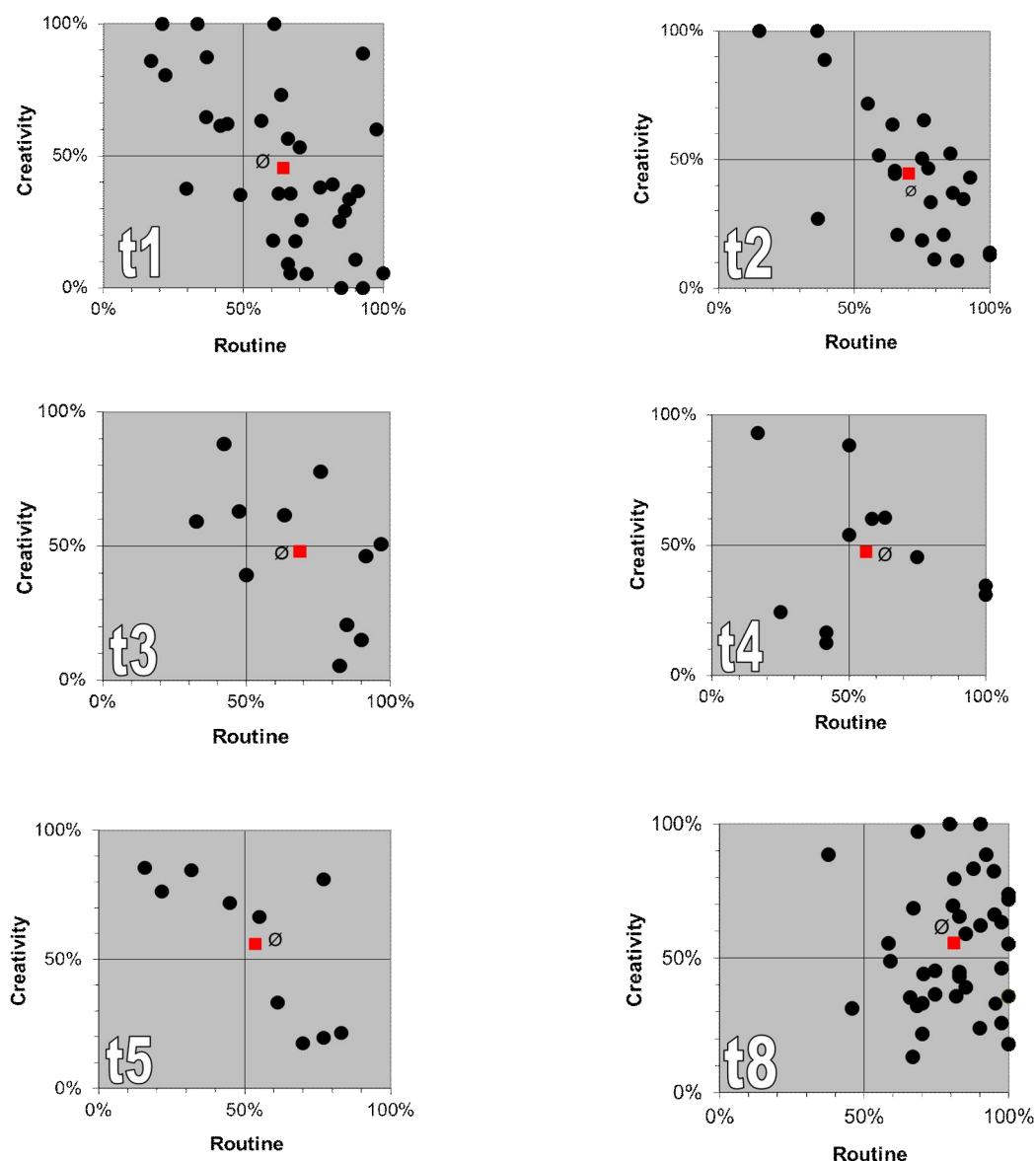


Figure 3. Creativity-routine profiles for the student participants from their 1st to their 5th semester (t1–t5) and for the professional translators (t8) (Bayer-Hohenwarter 2011: 291)

These creativity-routine-profiles also show that the students' average values hardly change from their first to their fourth semester, at least if they are considered as a group. Only in the fifth semester, an increase in creativity above the 50% line can be observed. The professional translators, however, show higher creativity and routine scores, as had been expected. This points to their ability to switch between a routine mode of translation and a creative mode of translation without investing a high amount of cognitive effort when being creative. Bayer-Hohenwarter (2011: 123) calls this *switch competence*.

The difference between the students and the professional translators with regard to routine and creativity becomes even more obvious when the first-semester students' creativity-routine profile is compared with the professional translators' profile. With few exceptions, the first-semester students are either creative with a low degree of routine (left upper half) or betray routine behavior with a low degree of creativity (right lower half). The professional translators, however, combine a high degree of routine with a high degree of creativity (right upper half).

4.3 Tools and research competence

In connection with tools and research competence, Friederike Prassl has investigated, among other aspects, the participants' decision making-processes. Decision-making processes are analyzed in this context because all consultations of external resources are embedded in decision-making processes. In translation, these processes are initiated when the translator is insecure about the ST meaning or has doubts about how to formulate the TT. They come to an end when the final version has been written down. It is only within this larger context that the triggers of consultation processes become evident. Therefore, an analysis of tools and research competence was tackled via an analysis of decision-making processes. Prassl classifies decision-making processes using the decision-making typology developed by the psychologists Jungermann et al. (2005). They classify decision-making processes according to the cognitive effort involved in them into routinized decisions, stereotype decisions, reflected decisions and constructed decisions (Prassl 2010b: 60 ff.). Prassl adapted their definitions to the specific requirements of translation process research. According to her, routinized decision making occurs when, immediately after reception of a ST segment, a single translation option is retrieved automatically in a pattern-matching process and written down without any further modification or reflection. In stereotype decisions, more than one option is retrieved spontaneously without delay and the selection of the option written down is not guided by any recognizable rational criteria; it is selected more on an emotional, holistic basis. Reflected decision-making processes may also begin with automatically retrieved options; options, however, may also be the result of reflection and research in external resources. The selection of the version written down always happens in a conscious evaluation process. If towards the end of a reflected decision-making process questions remain unanswered whose answers, however, are deemed necessary to make a good

decision and the translator has to resort to guessing, constructed decisions are made (Prassl 2010b: 61 ff.). Table 5 gives a survey of the four decision-making types and their characteristics with regard to option retrieval and evaluation.

Table 5. Decision-making types in translation (according to Prassl 2010a: 106)

	Routinized decisions	Stereotype decisions	Reflected decisions	Constructed decisions
Retrieval of options	unconscious	unconscious	unconscious or conscious	conscious
Evaluation of options	–	non-deliberate	deliberate	deliberate with doubts remaining

In order to be able to classify all decision-making processes in an unambiguous manner, Prassl specified further translation-specific indicators for each decision-making type, which are beyond the scope of this article (see Prassl 2010b: 65 ff.). Since this procedure of analysis is too complex, too, to apply it to whole texts, five units of analysis were defined in each text to whose translation the procedure of analysis was restricted.⁵ Table 6 juxtaposes the values for those decision-making types that involve relatively low cognitive effort (routinized and stereotype) with those that involve much cognitive effort (reflected and constructed). The lighter columns in Table 6 give the absolute numbers of decisions in each of the two categories of decisions as well as the percentages of decisions that fall in each of the two categories (the two percentages always amount to 100%). The numbers and percentages in the darker columns indicate how many of the decisions in the columns to their left were correct. The last column gives the total of successful decisions.

be expected to be precise enough to register a development from semester to semester, it was at least precise enough to register the competence difference between the professional translators on the one hand and the students on the other (see the last two rows in Table 6). For the student participants, the measuring instrument cannot be expected to allow for comparisons on a semester-to-semester basis because the values were calculated on the basis of the decisions involved in the translation of only 5 specific units of translation in each of the experimental texts and since these units inevitably had different potentials for investing cognitive effort in their translation. In a comparison between student participants on the one hand and professional translators on the other, this variance is cancelled out because, considered as groups, both the students and the professional translators were confronted with the same range of translation units and thus the same overall potential for investing cognitive effort in the decisions involved in translating them. Against this background, it is not surprising that the students' results from semester to semester do not show any tendency of a development towards the professional translators' behavior, neither with regard to the relation of the two decision-making categories (low effort vs. high effort) to each other nor with regard to their overall success rates. In all decision-making categories (apart from constructed decisions which occur only very rarely), the students are considerably less successful than the professionals. The discrepancy in the success rates between the two groups of participants is highest for decisions involving low cognitive effort. In this category, the discrepancy is more than 20%, whereas in the category of decision-making types involving high cognitive effort it is only about 2%. The fact that professional translators decide more frequently without investing much cognitive effort and are more successful nevertheless also points to their higher routine like Bayer-Hohenwarter's creativity-routine profiles.

5 Summary and conclusion

In this article, the three concepts of multidisciplinary, interdisciplinarity and transdisciplinarity, which differ in the intensity of cooperation and interaction between disciplines, were differentiated following a sub-classification by Kaindl (1999). With regard to these three concepts, translation studies was classified as a discipline that has moved from the level of multidisciplinary to the level of interdisciplinarity. For a specific area of translation studies, i.e. the investigation of the development of translation competence towards its highest level, the level of translational expertise, the article outlined how it can enter into a transdisciplinary relationship with expertise research in cognitive psychology. These theoretical reflections were underpinned by methodological approaches and findings of the longitudinal study TransComp, which investigates the development of three translational sub-competencies in 12 students of translation over a period of three years and compares their translation processes and products with those of 10 professional translators with at least 10 years of experience in their profession. The hypotheses which formed the starting point of this investigation were derived from expertise research.

While the professional translators clearly outperformed the student group with regard to the variables analyzed, they were found to have not yet achieved expertise, the highest level of competence. The student participants' competence development over the first two thirds of their bachelor's program in translation did not follow a linear path; there seemed to be stagnation. Whether this changes in the last third of the bachelor's program and/or beyond will have to be answered in future analyses.

In the following, potential explanations of these findings will be discussed. Let us first consider the professional translators' competence which lags behind our expectations. In the literature on expertise, cognitive psychologists point out that the development of expertise, the highest level of competence, requires at least 10 years of training and deliberate practice. The state of expertise is characterized by consistently superior performance in the solution of tasks that are representative of the domain in which expertise has been acquired (Ericsson/Charness 1997: 6). At least five possible reasons can be provided for the fact that the professional translators among the TransComp participants had not yet acquired expertise despite their university degree in translation/interpreting and at least 10 years of professional experience as translators.

First, although they may have accumulated experience during their professional lives, they may have lacked the necessary deliberate practice that only occurs when the translation tasks to be performed are challenging (Shreve 2006: 29).

Second, professional translators, in many cases, do not get the continuous feedback on their translations that would be necessary for their competence to develop continuously (Shreve 1997: 128; 2006: 29, 32).

Third, the texts to be translated in the TransComp study may not have been among the genres that the professional translators who participated in the study were usually confronted with in their daily work. The professional translator RAN, for example, stated that the last time she had translated operating instructions texts was 10 years earlier. Against this argument the following objections can be made: The problematic ST units, on which our analyses focused, were not genre-specific. Terminological problems, as in the case of *control switch*, and passages in the ST which are illogical or require culture-specific adaptation, to give just a few examples of the problems involved in the translation of the TransComp texts, may occur in any genre, even in literary texts. The problem-solving strategies that the translation of the STs selected required should belong to the repertoire of any highly competent professional translator, no matter what genres they have specialized in. For this reason, this explanation seems rather unlikely to be valid.

A fourth reason for the professional translators' poor performance might be that they applied criteria (e.g. equivalence-oriented ones) that deviated from our functional approach. This explanation seems plausible because the professional translators who participated in the experiments had been trained when the equivalence-oriented paradigm was still prevalent at translator training institutions.

A very likely fifth reason that may at least have contributed to the professional translators' poor performance is that the experimental situation may have led to a lack of motivation. Motivation is a pre-requisite for excellent performance and translation quality. Therefore motivation occurs in a central position in my translation competence model (see Figure 1). The fact that the professional translators had to work in a laboratory situation and not at their usual workplace may also have been detrimental to their performance.

It is very likely that more than one of the reasons enumerated above, and perhaps a lot more, have had a negative effect on the professional translators' performance.

Stagnation in the students' competence development may also have several reasons. First, in the bachelor's program "Transcultural Communication", in which the student participants were enrolled, students do not start translating before their 5th semester (in the course "Translatorische Basiskompetenz I"). The first four semesters are mainly devoted to the development of language competence. In addition, they are confronted with linguistic and translation theory right from the beginning of their BA program. Against this background, stagnation in the development of their translation competence could either have been caused by a lack of practice in the first four semesters or by the separation of translation theory lectures on the one hand and translation practice courses on the other hand without them being interconnected to a sufficient extent, or by a combination of both. If the first reason holds true, student performance should improve with regard to at least some of the variables from their fifth semester on. Whereas lectures usually add to the students' declarative knowledge, courses and project work have the function of competence and skills development in the form of procedural knowledge. The stagnation in the students' competence development may be an indicator that this separation should be overcome. The example *control switch* clearly shows how important it is to proceed in a manner that is guided by criteria and to gain an awareness of the criteria before embarking on the search for an appropriate translation. The criteria to be applied, however, are closely connected to the theory from which one starts. As a consequence, theory and practice should not be separated.

A second explanation for the stagnation or rather the seeming stagnation in the students' competence development, which is connected with the first one, may be that the students' problem awareness may have grown during their first semesters (e.g. due to their exposure to translation theories in their lectures) whereas their problem-solving competence may have lagged behind due to a lack of practice. Increasing problem awareness in combination with a lack of routine that has not yet been acquired requires a lot of working memory capacity that will then not be available for problem solving in a narrower sense. As a consequence, only very short translation units can be tackled and only few relevant criteria be taken into account, both of which are detrimental to translation quality. With regard to the students' translation competence, especially their strategic competence, the following hypothesis can be derived from this: Their

translation competence development does not stagnate over the first semesters. There is rather a shift in the allocation of their cognitive resources that does not yet have an effect on the translation quality of their output and thus could not be measured using the instruments we applied. Against this background, it seems worthwhile to investigate whether the quality of their translation products increases once their increased problem awareness is accompanied by a higher amount of routine acquired in practical translation courses. Here we have to take into account a phenomenon that Jääskeläinen (2002: 111) called “developmental hypothesis”. This hypothesis is based on the observations of several translation process researchers (Gerloff 1988: 54 ff.; Krings 1988; Jääskeläinen/Tirkkonen-Condit 1991) who found that the problems which become the object of conscious decision-making processes in translation do not decrease in number as a translators’ competence increases, but change in quality in the course of time. This observation is corroborated by findings from expertise research (z. B. Dreyfus/Dreyfus 1986; Ericsson/Smith 1991: 25 f; Anderson 1990).

Third, it must be taken into account that translation competence acquisition is combined with language acquisition (Bergen 2009). Findings with regard to comprehension problems, for example, suggest that stagnation in the development of translation competence may be accompanied by a process (or perhaps even an accelerated process) of language acquisition. This suggests that the acquisition of competences always has to be seen against the background of other competences whose development may accompany the process.

The map that we have been able to draw of the development of translation competence so far is still very rough. To refine it, we do not only need to improve our research and measuring instruments. We also need to gain deeper insights into the competencies to which translation competence in the narrower sense is related. Disciplines with which cooperation seems to be most fruitful here in an importing interdisciplinary perspective are bilingualism research, foreign language teaching and developmental psychology. From bilingualism research and foreign language teaching we could gain insights into the development of linguistic sub-competencies that, although they are not translation-specific, may have an impact on the development of translation competence. In developmental psychology, non-linear development of motor and cognitive competencies has been observed (Thelen/Smith 1994); explanations of this non-linearity may be transferrable to our observations with regard to the development of translation competence. All insights we gain from this collaboration can be fed back into expertise research where they can be used for the construction of a general theory of expertise. And this general theory of expertise may then again benefit each individual discipline in the exploration of expertise in its specific domains.

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¹ For a further subdifferentiation of the expertise concept, see Jääskeläinen (2010).

² ‘Lag’ indicates the time elapsed from the moment the relevant text was translated first to the moment it was re-translated for the purpose of comparison. MLE dropped out before the 4th-semester experiments started.

³ The difficulty of the texts was not determined in a formal procedure; it was assessed in self-experiments by two experienced teachers of translation.

⁴ At the beginning of the second semester, two more texts, A5 and B5, had to be translated. These texts, however, only had to be translated by the other student group at the beginning of their sixth semester. Since the complete set of data from the sixth semester was not yet available when this article was written, but would have been needed for the normalization procedure, the translations of the texts A5 and B5 were not taken into account here.

⁵ Some of these units of analysis involved more than one decision-making process so that more than five decisions may have been analyzed per text.