Machine translation literacy in the lower secondary classroom

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Aktuelle Studien weisen darauf hin, dass Lehrpersonen und Lernende oft unsicher im Umgang mit *Machine Translation* (MT) sind, und dass ein mittleres Sprachniveau erforderlich sei, um *MT-Literacy* auszubilden. In Anbetracht der Tatsache, dass Übersetzungsmaschinen in den meisten Klassenzimmern, oft im Verborgenen, verwendet werden, argumentiert dieser Artikel, dass die Förderung von *MT-Literacy* bereits in den frühen Phasen des Sprachenlernens beginnen sollte. In sechs Klassen der Sekundarstufe I wurde ein sechswöchiges Strategietraining zu *MT-Literacy* durchgeführt. Fragebögen und Fokusgruppeninterviews wurden eingesetzt, um die Wahrnehmung der Lernenden in Bezug auf die Nutzung von MT zu untersuchen. Vor dem Strategietraining schienen die Schüler*innen ein sehr niedriges Niveau an *MT-Literacy* zu haben, entsprechend empfanden sie einfache Strategien zum sinnvollen Einsatz von MT als hilfreich. Obwohl die Einschätzungen zur wahrgenommenen Nützlichkeit von MT über die Messzeitpunkte hinweg relativ stabil blieben, zeigt die deutliche Zunahme positiver Emotionen, dass die explizite Erlaubnis des MT-Einsatzes im Klassenzimmer die Grundlage für die Entwicklung von *MT-Literacy* bereits auf niedrigen Sprachniveaus schaffen kann.

Stichwörter:
Übersetzungsmaschinen, Fremdsprachenunterricht, Sekundarstufe I, Strategien, MT-Literacy

Keywords:
machine translation, language teaching, lower secondary school, strategies, MT literacy

1. Introduction

As the quality of machine-translated texts continues to improve, it is unsurprising that learners are increasingly turning to them as well, for example to write essays in foreign languages (Jolley & Maimone 2022). Despite the evident use of machine translation (MT) tools such as DeepL and Google Translate, their adoption in lower secondary education in Switzerland remains less frequent compared to more advanced educational levels (Udry & Berthele 2023). Consequently, lower secondary teachers are uncertain about how to handle MT use in the classroom (Raaflaub & Reber 2022). This article focuses on how learners in six lower secondary classrooms perceived the use of MT before and after receiving training on how to use MT effectively.

2. MT in the foreign language classroom

Learners' motivations for adopting MT tools are diverse, with easy accessibility, speed and unrestricted availability being significant factors (cf. Jolley & Maimone 2022). In addition, learners struggling with confidence and anxiety in foreign language writing may find MT tools a supportive resource. It has been found that MT use has a positive impact on text quality, resulting in more extensive and accurate texts and favourable grading outcomes (Jolley & Maimone 2022). Studies on MT use and language acquisition suggest short-term benefits with no evidence of long-term negative effects (Fredholm 2019; O'Neill 2019). Although, for example, MT-induced gains in lexical diversity may not be enduring (Fredholm 2019), MT tools can expose learners to a range of vocabulary that they might not otherwise encounter.

Some scholars link successful MT use to a specific language proficiency level (e.g. Fredholm 2019; Carré et al. 2022). Carré et al. (2022), for example, claim that a language proficiency threshold equivalent to B1 or B2 in the Common European Framework of Reference (CEFR) is necessary for successful MT use during tasks such as essay composition and oral presentation preparation. In their review, Klimova et al. (2023) state that learners' language proficiency influences the effective use of MT, but they also highlight studies suggesting that low-level learners using MT during writing activities may benefit from increased exposure to words of personal significance (potentially enhancing incidental vocabulary acquisition) and more effective communication (Klimova et al. 2023). Nevertheless, the existing literature still lacks clear evidence linking language acquisition to the use of MT applications. Furthermore, there is no clear indication of whether a specific proficiency level is required to use MT as a language learning tool (cf. Jolley & Maimone 2022; Klimova et al. 2023).

In the lower secondary classroom, MT tools are predominantly used to look up single words to facilitate text composition and prepare oral presentations (Perrin et al. 2022; Udry & Berthele 2023). This preference for single-word translations seems to be rooted in the idea that single words are easier to retain than larger units of text. Learners claim that MT is only beneficial in language learning when they are repeatedly exposed to a particular word or when they actively write it down multiple times to memorize it (Perrin et al. 2022). However, today's MT tools offer features that can serve purposes beyond simply finding a suitable single-word translation. DeepL, for example, allows the user to click on a word and presents a range of possible alternatives. Once an alternative word is selected, the machine automatically adjusts the sentence to accommodate the chosen word. This and other functions, such as listening to the pronunciation of words or being able to reverse translate, offer learners many more possibilities to engage with the language than paper-based dictionaries. Udry & Berthele (2023) suggest there may be untapped potential for MT integration into more

complex language tasks, particularly when learners have to engage in high levels of cognitive processing while using MT.

Low-level learners may benefit from increased exposure and production when they use the full range of tool functions. If learners run texts through the machine and blindly trust any MT-generated output, they may miss possible learning opportunities. This may occur when learners believe they lack the linguistic competencies to critically assess and engage with the input and output. Given such potentially unsuccessful use of MT, it is not surprising that both students and teachers have mixed attitudes towards the integration of MT tools in language learning classrooms (Deng & Yu 2022; Raaflaub & Reber 2022). Some teachers argue that learners use translation machines instead of making an effort themselves and therefore ban their learners from using them (Raaflaub & Reber 2022), which may result in their use being seen as unethical or as a form of cheating.

Given the widespread use and possible benefits of MT, the question is under what conditions it should be integrated into the foreign language classroom, rather than whether it should be included at all (Klimova et al. 2023). This shift in perspective requires moving beyond viewing MT as "cheating" (Raaflaub & Reber 2022) towards understanding it as a linguistic resource that provides suggestions rather than perfect translations (Pym et al. 2013). To achieve this, several scholars consider the development of MT literacy to be crucial for language learning (O'Brien & Ehrensberger-Dow 2020). Bowker (2020) conceptualises MT literacy as the ability to approach MT critically and strategically, focusing on whether, when, why and how to use it without resorting to simplistic copy–paste behaviours.

Addressing MT literacy appears especially relevant in lower secondary classrooms where students have more limited language proficiency and fewer capabilities to engage effectively with MT and enhance translation quality. While researchers have established theoretical frameworks for MT literacy and identified potential applications in language learning, no clear definition exists of what MT literacy entails across different educational contexts and proficiency levels. In addition, there is limited empirical evidence regarding students' actual perceptions and experiences, particularly at the lower secondary level.

3. Project description

Our project, Using Translation Machines Competently, addressed these shortcomings by investigating how teachers' and learners' attitudes towards MT change when its use is explicitly taught and permitted in the classroom.

The project involved six grade 8 classes (13–14-year-old students) and five English teachers. In this educational context, students learn French as their first foreign language in grade 3, and English as a second foreign language in grade 5. According to the CEFR, they are expected to reach a minimum level of A2.2

(A2.1 for writing) by the end of grade 8, working their way up to B1 or higher towards the end of year 9.

While the overall project addressed both teacher and learner perspectives, this article focuses exclusively on learners' perceptions of MT use in the classroom, responding to the following questions:

- RQ1: How do learners perceive the usefulness of MT and MT literacy strategies for language learning?

- RQ2: How do learners' perceptions of the usefulness of MT change when MT tools are explicitly allowed in the classroom?

A six-week training programme on the use of MT was developed at Bern University of Teacher Education, Switzerland. The training was based on the following basic definition of MT literacy for a lower secondary context, developed as part of an earlier project (Raaflaub & Reber 2022). An MT literate learner should

- understand the requirements for using MT (e.g. well-structured and correctly spelt input text)

- know various techniques for using translation machines (e.g. selecting word variants to adapt and simplify a translated text, knowing how to use the pronunciation function)

- decide at what point in the task process the use of MT might help them (e.g. understanding task instructions, checking whether a text is appropriate for a specific audience).

In collaboration with another project (Hofmann 2025), a set of strategies was developed, which were validated through expert discussions prior to implementation. The strategy training was integrated into the regional compulsory teaching material to ensure a close tie to classroom practice. To this end, some tasks had to be adapted, for example by combining several shorter tasks into a more complex activity that necessitated MT use and the subsequent evaluation of its output. A comprehensive teacher's guide was also developed (cf. Reber & Raaflaub 2025).

The strategy training programme was implemented by lower secondary English teachers in their classrooms, as illustrated in Figure 1. In the first unit, learners were introduced to various strategies for employing MT while engaging with adapted coursebook tasks. In the second unit, teachers maintained pedagogical autonomy in implementing coursebook activities, although learner access to MT remained unrestricted throughout. Notably, prior to this project, MT use had been prohibited in five of the six classes, and four teachers expressed scepticism regarding its potential in the classroom.
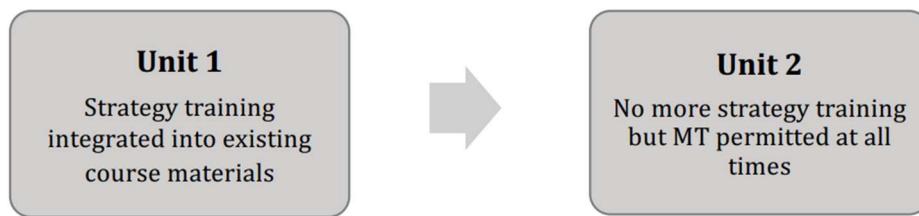
Figure 1: Strategy training

DeepL was chosen as the tool for MT because it offered the most functions at the time of the intervention. The training included activities focusing on MT literacy and process writing. The following are some examples of the MT literacy strategies:

1. Consider what you find challenging about a task and decide whether and how the use of MT can help you.

2. Provide the machine with enough context so that it can deliver better results.

3. Make sure that your (German) input text is already well structured.

4. Make sure that the spelling and grammar of your (German) text are correct.

5. Don't be satisfied with the first translation. Click on a word to see alternatives.

6. Translate a text back and forth, swap words (click on word variants) or rephrase passages until you are completely satisfied with the result.

7. Ensure that your language is understandable for the target audience.

8. Have your text read out loud to practise pronunciation.

To illustrate the strategy training programme (Unit 1), an example activity is briefly described. In one of the main tasks, students were asked to prepare a short presentation to tell their classmates about their taste in music and their current favourite song. During the task, students were asked to use MT to check how enthusiastic their presentation sounded (cf. Figure 2).

How enthusiastic does the presentation sound?

You have already learned some words like 'super' or 'really' [in the course book] that can make a text sound more enthusiastic. But your presentation can sound even more engaging if you don't use the same words over and over.

Don't be satisfied with the first translation. Click on a word to see alternatives.

Translation machines can help you find different word variants. The site [DeepL website] also has a dictionary that explains the words. But be careful: only choose words you really understand!

Figure 2: Sample activity

4. Data collection

To answer the research questions, we conducted an exploratory study employing triangulation through multiple data sources. Data were collected through questionnaires containing both closed and open-ended questions (N = 112 students), focus group interviews with three selected learners from each of the five classes (n = 15) administered at three time points, and classroom observations by the two researchers. Sample sizes varied across the three measurement points (N = 112 at T1, N = 90 at T2, N = 100 at T3), as some classes did not complete questionnaires at certain time points. The closed questionnaire items provided descriptive baseline data on learners' perceptions of MT usefulness before and after the strategy training, while open-ended responses and focus group interviews explored students' opinions and reasons for MT use in more depth. Classroom observations were employed to verify that teachers implemented the adapted coursebook tasks according to the research design and that learners maintained access to MT throughout. Data collection took place over a six-month period from August 2022 to January 2023, as summarised in Figure 3.

T1 (August 2022)	Unit 1 Strategy training integrated into existing course materials	T2 (October 2022)	Unit 2 No more strategy training but MT permitted at all times	T3 (January 2023)
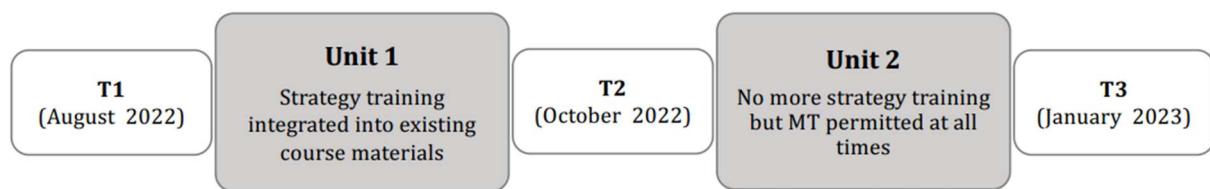
Figure 3: Data collection

Closed questionnaire items underwent descriptive analysis. Qualitative content analysis was conducted on the open-ended responses and the focus group interview transcripts utilising a deductive–inductive approach (Kuckartz 2018). The responses to the open-ended questions in questionnaires were analysed by two independent researchers and subsequently compared for intercoder agreement (Kappa = 0.86). The interview transcripts were consensually coded

by the two researchers. The data were collected in German and translated into English for this article.

5. Selected results

Selected findings from the study are presented below, organised by research question.

4.1 Perception of the usefulness of MT and MT literacy strategies (RQ1)

4.1.1 Overall perceived usefulness

In the questionnaires, students were asked to rate how helpful they found the use of MT for learning English. Results on a Likert scale from 1 (not at all) to 6 (very much) indicate that learners perceived MT as relatively helpful. The mean score at T1 was 3.78 (SD 1.34), at T2 it was 3.93 (SD 1.26), and at T3 it was 3.45 (SD 1.27). The results show that the perception of the utility of MT remained relatively stable across different time points.

4.1.2 Specific purposes of MT use

The students were asked, by means of an open-ended question, to elaborate on the purposes for which they found MT helpful. They identified both general and specific purposes for MT use. The general purposes identified included support-related reasons, where students viewed MT as providing useful assistance, and learning-effect purposes, where students believed MT use contributed to their overall language learning. More specific purposes focused on the linguistic units being translated: word-level purposes referred to using MT for individual words, while text- or sentence-level purposes involved translating larger linguistic units. In addition, time-saving purposes emerged as a distinct category, with students highlighting the usefulness of MT in completing tasks more quickly. Table 1 presents the frequency distribution across the three measurement points.

Purpose	*T1 (N=112)*	*T2 (N=90)*	*T3 (N=100)*
Time-saving	17 (15.2 %)	4 (4.4 %)	9 (9.0 %)
Support	6 (5.4 %)	13 (14.4 %)	13 (13.0 %)
Text/Sentence translation	3 (2.7 %)	2 (2.2 %)	0 (0.0 %)
Word translation	24 (21.4 %)	9 (10.0 %)	14 (14.0 %)
Learning effect	2 (1.8 %)	10 (11.1 %)	5 (5.0 %)
Other purposes	25 (22.3 %)	33 (36.7 %)	30 (30.0 %)
No response	35 (31.3 %)	19 (21.1 %)	29 (29.0 %)

Table 1: Purposes for which students found MT helpful across time points

At T1, the most frequently mentioned reason for using MT was word translation, followed by time saving. At T2, after the strategy training, mentions of general support-related purposes and learning effects increased notably. From T2 to T3, when students used MT without specific guidance, word translation purposes

increased again while learning effect purposes decreased. Support-related purposes remained stable between T2 and T3. Across all time points, text and sentence translation purposes were only rarely mentioned.

Students reported finding MT most useful for translating individual words rather than complete sentences or texts. The following open-ended responses illustrate this preference and suggest possible explanations for its underlying rationale. Specifically, students appeared to perceive the translation of larger textual units as counterproductive to their learning, as such practices may transfer cognitive responsibility from the learner to the machine.

> (1) Sometimes it's useful to translate individual words. But not to translate entire texts. (4R-0411)

> (2) So, if it's just words, it's good but it could lead to everyone just translating and not thinking for themselves anymore. (4R-0308)

4.1.3 Most helpful MT strategies

After completing the strategy training (T2), students were asked about the strategies they found most helpful (N = 90). Most frequently listed was strategy 5 (clicking on a translated word to see its alternatives: 40 mentions) followed by strategies 4 (correct input text: 31 mentions), 3 (well-structured input text: 29 mentions) and 2 (providing enough context: 22 mentions). Twenty-one students either did not indicate any strategies or mentioned not using DeepL (cf. Table 2).

Strategy	Description	Mentions
5	Don't be satisfied with the first translation. Click on a word to see alternatives.	40
4	Make sure that the spelling and grammar of your (German) text are correct.	31
3	Make sure that your (German) input text is already well structured.	29
2	Provide the machine with enough context so that it can deliver better results.	22
-	No strategy/Did not use	21

Table 2: Most helpful MT strategies (T2, N = 90, multiple responses possible)

In the focus group interview at T3, students described strategy 5 as something they were not aware of or did not use before the strategy training. They mentioned that this strategy helped them to write more varied texts and to use MT to create texts that they could understand at their language level.

> **(1) Transcription of third focus group interview**
> Well, I used to always be satisfied with the first word. And now again and again, I change the word. (3F 0601 0602 0603, line 37)

They also described the MT literacy strategies as tricks that could assist them in text production.

> **(2) Transcription of the third focus group interview**
> Then I would also say that with DeepL, also with the strategies, I can produce much better texts than before. I also have a feeling now and have tricks on how I can produce good texts without it being obvious that, okay, I got that from DeepL. (3F 0107, line 38)

Still, some students reported that the use of MT was not necessary as the teacher usually provided the words to be used and memorised.

> **(3) Transcription of the third focus group interview**
> I think we simply did a lot in class, too. That's why Ms X was our translation machine. (3F 0505 0511 0512, line 2)

An additional aspect frequently mentioned in the focus group interviews concerned the target language and language proficiency. Although French is their first foreign language, many students reported that they considered MT more useful in their French classroom, as they perceived their language proficiency to be lower than in English. The quote below is an example of this opinion:

> **(4) Transcription of the first focus group interview**
> Moderator: Why do you find MT more useful for French than for English?
> 0501: French is a difficult language.
> 0502: Yes, I can speak English better than French and I understand it better. (1F-05-0505-0511-0512, line 27-32)

4.2 Changes in perceptions (RQ2)

In an open-ended questionnaire question, students were asked how they felt about using MT in English classes. At time point T1 (N = 112), the distribution of responses indicated considerable uncertainty about MT use in the classroom. Among the 112 participants, 13 students expressed positive emotions, with "relieved" being the most frequently mentioned feeling (8 mentions), followed by "good" (4 mentions) and "proud" (1 mention). In contrast, 18 students reported negative emotions, predominantly characterised by feelings of discomfort or unease. Specifically, 10 students mentioned feeling "uncomfortable" or that using MT "didn't feel right", while five students expressed concern that their MT use "could be noticed" by the teacher. Three students explicitly stated they felt "not proud" or "not good" about using the tool. Notably, the majority of participants (72 students) either did not respond to this question or provided neutral or descriptive responses (cf. Table 3).

At time point T3 (N = 100), learners were asked the same question again. Accordingly, the proportion of students expressing positive emotions increased to 51, while negative responses decreased to six students. Neutral feelings were reported by 24 students. The non-response rate also declined to 19 students.

Response category	*T1 (N = 112)*	*T3 (N = 100)*
Positive emotions	13 (11.6 %)	51 (51.0 %)
Negative emotions	18 (16.1 %)	6 (6.0 %)
Neutral feelings	9 (8.0 %)	24 (24.0 %)
No response/Did not use/Other	72 (64.3 %)	19 (19.0 %)

Table 3: Students' emotional responses to MT use at T1 and T3

The analysis of students' responses at T3 provides insight into the reasons underlying these more positive perceptions. Among the 51 students expressing positive emotions, 22 reported feeling "very good" or "comfortable", while 13 indicated feeling "proud". These positive feelings were frequently attributed to the perceived ability to produce more varied texts of higher quality.

> (3) I was rather proud because I now tried to write in a more varied way and use different words. (4R-0308)

Another reason given for feeling good or proud was that the "secrecy of use was gone".

> (4) Good because I knew I wasn't the only one. (4R-0405)

> (5) Rather proud of the text at the end because you were allowed to [use it in the classroom]. (4R-0316)

Eleven learners reported that they felt "relieved" or "reassured", often connecting these emotions to the supportive role MT played during task completion and the sense of security provided by having access to immediate linguistic feedback.

> (6) I felt relieved because I sometimes get stressed when I see gaps in the text. (4R-0213)

For some students, MT functioned as an enabler of classroom participation. Five learners explicitly noted how the tool facilitated their engagement with classroom activities.

> (7) It was easier because then I was able to understand the task. (4R-0520)

While positive responses predominated at T3, some students continued to experience discomfort with MT use. Among the six students reporting negative emotions, three described feeling "(rather) uncomfortable", two mentioned feeling "strange" owing to the typical prohibition of MT in their classes, and one student characterised MT use as "cheating".

Twenty-four learners described their feelings as neutral, while the remaining 19 learners either made no comment or described the functions of MT or said that they did not use MT

In a focus group interview at T3, one student illustrated the scaffolding function of MT by describing it as a "safeguard".

(5) Transcription of the third focus group interview
I found it very good. I found it very handy that you could like, when you got a task, you knew like, if I don't get ahead, I still have DeepL. That was a relief and a bit of a safeguard. Where you knew like, okay, if I need help now or can just use [it?] with a sentence and you don't have to look in other books or always ask the teacher and I found that really, really good [...]. (3F 107, line 4)

6. Discussion

The findings reveal that while learners' overall ratings of MT usefulness remained relatively stable across time points, their emotional responses to MT use in the classroom changed markedly, with positive emotions increasing following the intervention. Confirming results from previous studies in Switzerland (Perrin et al. 2022; Udry & Berthele 2023), the perceived usefulness of MT for language learning was most often linked to the translation of isolated words. This seems to reflect a view on vocabulary learning that favours the memorisation of a predefined set of isolated words over the exposure to or investigation of lexis as chunks of language embedded in texts of personal meaning.

6.1 MT literacy development

The results suggest that learners' MT literacy was very low or non-existent before the project started. Learners considered rather basic strategies as most helpful. For example, the fact that DeepL allows for the selection of different word variants seems to have been new but quite useful knowledge for many learners, supporting them to move from simple copy and paste to creating level-appropriate texts. Nevertheless, only a few learners expressed the possible benefits of using word variants and of being able to change single words embedded in the translation of a sentence or paragraph for their language learning.

It should be noted that the intervention took place over a six-week period and most of the strategies could only be introduced and practised briefly. More extensive, ongoing training in MT literacy could have helped both learners and teachers to focus more on the potential benefits of engaging with the input and output of translation machines, thus enabling students to become more metacognitively active learners who can actually learn while using MT (Sato 2023).

6.2 Emotional changes

The results also suggest that once the use of MT was trained and always permitted, learners expressed more positive emotions towards MT use. The absence of its "forbidden" nature seems to have enabled students to explore the potential of MT for their individual learning. At the same time, this change was only possible because the teachers' participation in the project resulted in moving away from any secrecy. A very recent study on teachers' perspectives on MT use in the classroom revealed that teachers should support the

meaningful application of MT while reassessing their own ideals related to language learning and MT use (Hofmann 2025). Teachers seem to play a crucial role, with their beliefs and perceptions influencing the integration of technology in the classroom (Deng & Yu 2022). The effectiveness of any strategy training probably depends on two key factors: the teacher's willingness to allow learners to take control of their learning process, and learners' willingness to engage with machine input and output. This approach prioritises long-term language development over short-term task completion (Carré et al. 2022).

6.3 Implications for practice

Overall, the effect of the strategy training seems to be related more to the fact that MT was allowed than to the strategy training itself, highlighting the importance of addressing the "forbidden" nature of MT use in educational contexts. Nevertheless, even at these low proficiency levels, learners reported some more sophisticated uses of MT. It seems some learners have found a way to use the machine as a resource without blindly trusting its output, allowing them to engage with the task while still benefiting from the machine's support. They discovered methods to leverage machine assistance without resorting to cheating, specifically by using the machine output as a starting point or resource only, and continuing to refine and improve the text. They maintained control over their texts and avoided blindly transferring cognitive responsibility to the machine.

Provided they are given the right tasks, learners at lower levels may be able to use the different functions of MT tools to engage with the language. Activity types such as awareness-raising tasks focusing on lexical choice or supporting learners in comparing original and machine-translated texts might be particularly helpful for low-level learners (Klimova et al. 2023). It seems that even at lower proficiency levels, learners can benefit from MT literacy training, even if such training represents only the beginning of their journey towards complete MT literacy.

7. Limitations and future research

There is clearly a need for ongoing work on MT literacy in different educational contexts, as early results may not fully capture its impact. Since the results are based on learners' self-reports, factors such as social desirability may have influenced the findings, particularly given that some teachers' sceptical views on MT use in language learning may have shaped learners' attitudes (Hellmich & Vinall 2021).

Longitudinal studies could help to provide a more comprehensive picture of the impact of MT on language learning. In particular, it might be valuable to observe students' actual use of MT rather than relying solely on self-reports. It might also be beneficial to further investigate students' use of MT at different language

levels and possibly in different foreign languages. For the moment, as part of the project described in this article, a website has been developed to provide practical teaching tools and offer ideas for classroom practice related to incorporating MT in writing tasks:

 https://ttim.phbern.ch/uebersetzungsmaschinen/

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