

Enhancing teaching quality through analysis tools in an international context. Findings from the Erasmus+ INA Project

Thomas Schöftner¹

Private University of Education, Diocese of Linz, Austria

ABSTRACT

The cross-national Erasmus+ project "INA" investigated the effectiveness of analysis and observation sheets (AS) in four European countries (Austria, Spain, Finland, and Germany) to enhance teaching quality.

In a predominantly quantitative, partly comparative design with three data collection points, $N = 109$ participants (56 in-service teachers, 43 students) were surveyed on their competence development and motivation. Ethical standards were followed through written informed consent and strict anonymization. Reliability (Cronbach's Alpha $\alpha = .72-.86$) and validity (expert ratings, construct validity) measures ensured robust instruments.

Prolonged use of AS correlated positively with improved self-assessment and external assessment of classroom management and subject expertise, with students reporting considerable gains in social competence, resilience, and the use of didactic materials.

Embedding AS into research-based learning fosters reflective practice and incremental improvements in teaching quality, although cultural differences and institutional contexts require adaptations. Future research should expand the sample to various types of schools, refine measurement tools, and further integrate qualitative methods.

Keywords: Teaching quality and teacher effectiveness; Erasmus+ capacity building; Assessment methods; Competency development framework; Intercultural competences.

1. Introduction

The "INA" research initiative was established with the objective of evaluating and enhancing teaching quality across a range of school systems and socio-cultural contexts. The initiative utilised a set of instruments designed to facilitate systematic reflection on the planning, implementation, and analysis of lessons by teachers and students. These instruments included structured analysis sheets (AS) and targeted observation assignments.

1.1. *The importance of analysis tools and research-based learning*

The quality of teaching is contingent on the presence of well-developed classroom management skills, a profound understanding of the subject matter, and the possession of strong social-communicative competencies. Classroom management, which includes strategies for handling group dynamics and disruptive behaviours, as well as subject expertise in content and didactics, is a fundamental component of teacher education (Karner, 2012; Mayr, 1994). Furthermore, social-emotional factors, such as resilience and communicative competence, have been demonstrated to significantly influence teaching quality and student outcomes (Schaufeli & Bakker, 2017).

Research-based learning has been shown to enhance reflective competence among prospective teachers, fostering the development of professional characteristics early in their careers (Reitinger, 2015). Structured observation and feedback mechanisms further facilitate focused self-assessment and peer coaching, enabling teachers to navigate complex pedagogical tasks more effectively (Seyfried & Seel, 2005). In this context, the

¹ Contact address: thomas.schoeftner@ph-linz.at

Erasmus+ "INA" project was initiated to develop and test analysis sheets (AS) as tools to systematically guide the planning, observation, and reflection of lessons across diverse socio-cultural contexts. The materials were designed to promote teaching quality by supporting professional competence development in areas such as classroom management, social skills, resilience, and the use of didactic materials.

Shulman's concept of Pedagogical Content Knowledge (PCK) highlights the significance of the interplay between deep content expertise and pedagogical know-how in effective teaching (Shulman, 1986, p. 9). Furthermore, Loughran (2002, p. 36) emphasises the critical role of reflective practice in self-directed teacher development. Recent studies have indicated that integrating research-based learning into teacher education can significantly enhance instructional quality and promote competency growth, particularly through systematic observation assignments. More recently, scholars have broadened the PCK framework to incorporate digital resources, referring to this expanded model as Technological Pedagogical Content Knowledge (TPACK) (Koehler et al., 2013, p. 15). The structured AS which were tested in the Erasmus+ INA project serve as a practical means to engage educators in systematic reflection on subject delivery, adaptation, and the potential enrichment of lessons via purposeful technology and instructional interventions by situating the use of AS within a TPACK lens, teachers may become more attuned to how targeted modes of technology support student engagement and overall learning outcomes.

1.2. Practical relevance and motivation

Intrinsic motivation and the practical relevance of teaching tools have been identified as key drivers of teacher development and competence acquisition. Teachers who recognize the benefits of research-based materials often show significant gains in professional skills and a readiness to adopt innovative methods (Seyfried & Seel, 2005). The Erasmus+ project "INA" is predicated on these insights, hypothesising that long-term use of AS, combined with collegial reflection, enhances competences in teaching domains.

The utilisation of structured tools, such as standardized observation sheets, has been demonstrated to enhance awareness of classroom dynamics and to empower teachers to engage in "research in their own classrooms". These instruments support inquiry-based learning and reflective practices, which are essential for professional growth (Reitinger, 2015). The utilisation of clear and user-friendly forms has been demonstrated to facilitate a number of key aspects of pedagogical practice, including lesson planning, self-regulation, and the reception of external feedback (Karner, 2012). The "INA" project extends these findings by testing AS across Austria, Spain, Finland, and Germany to evaluate their effectiveness in diverse socio-cultural contexts.

The overarching objective of the project is twofold: firstly, to enhance teaching quality and, secondly, to establish transnational standards through practical implementation in collegial supervision. Prior studies have underscored the significance of practical relevance in the effectiveness of tools such as AS, particularly in terms of its impact on teacher motivation and the success of intervention strategies. Research-based learning elements, such as reflective dialogue and goal-oriented observation, have been identified as further supports for professional growth in both in-service and prospective teachers (Reitinger et al., 2016).

The systematic analysis of the Erasmus+ project proposal resulted in the following research question (RQ) and associated hypotheses (H):

RQ 1: Are analysis sheets (AS) and observation materials suitable for the further development of professional competence in an international context?

H 1: The practical relevance of a chosen focus plays a decisive role in the effectiveness of the intervention (Seyfried & Seel, 2005).

H 2: Different settings of teachers and "critical friends" give the process a binding character and thus promote effectiveness.

H 3: The materials (AS) can be used equally well in different national and cultural contexts.

H 4: Process documentation in the use of analysis sheets (AS) plays an important role in the further development of professional competence.

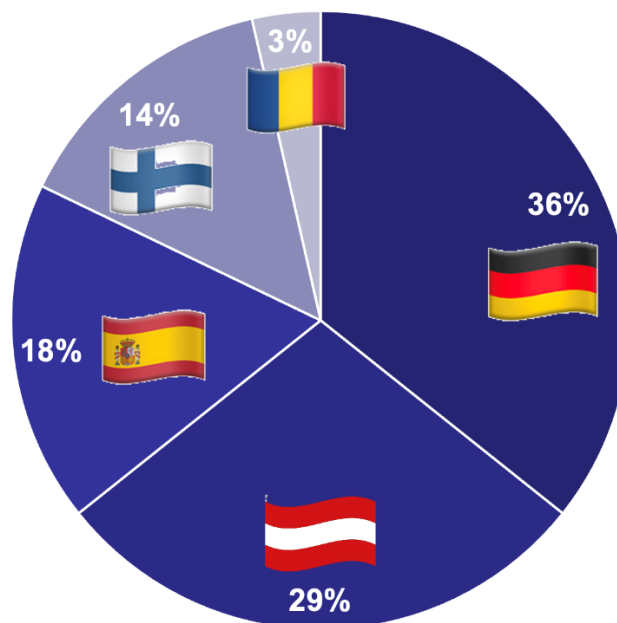
H 5: Teachers research their lessons – elements of the research-based learning processes are helpful (Reitinger, 2015; Reitinger et al., 2016).

2. Research methodology and field access

2.1. Sample and survey instruments

A non-randomized, self-selected sample of $N = 109$ participants (56 in-service teachers and 43 students) took part in this mixed-methods study combining both quantitative and qualitative approaches. Participants were drawn from Austria, Spain, Finland and Germany, providing an intercultural context and including both early career and experienced teachers as well as students on placement, thus ensuring a heterogeneous professional background. Data were collected through two questionnaires and video-based observations. Questionnaire 1 collected demographic information, confounding variables (such as personality characteristics and well-being), self-assessed competence items, and motivation regulation. Questionnaire 2 focused on actual use and perceived suitability of the AS, as well as external assessments of competence. Participants also undertook self- and peer-observations in authentic teaching situations, and reliability indices for the main scales ranged from .72 to .86 (Cronbach's alpha). Expert ratings supported content validity, while correlations between motivation, competence and use of the assessment system supported construct validity.

Figure 1. Participants from different international and cultural contexts

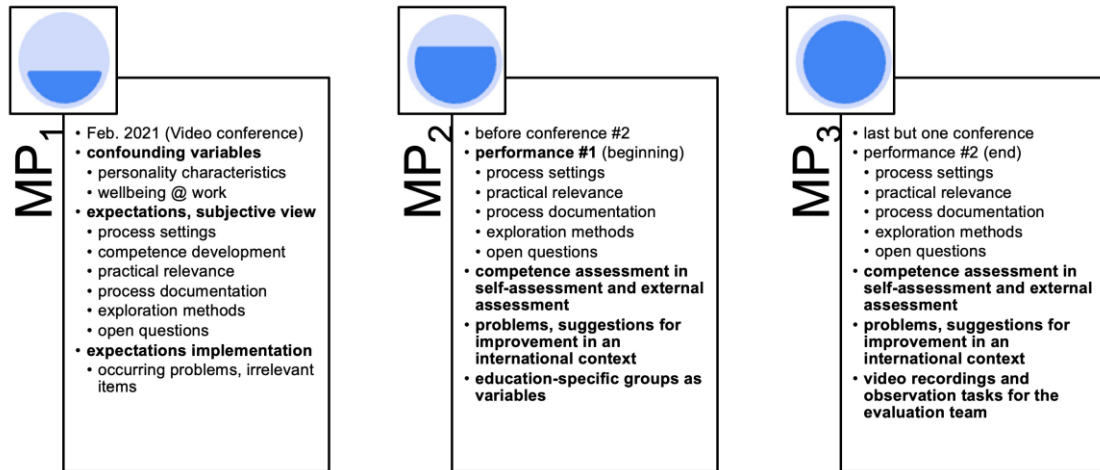


2.2. Research design

A mixed-methods intervention study was conducted with three measurement points (MP) to track changes over time. Data were collected at three MP (start, mid, end of the intervention) to examine changes in teacher and student competences over time. At MP 1, demographic data and potential confounding variables (e.g. personality characteristics (Mayr, 1994), well-being (Schaufeli & Bakker, 2017)) were collected. Due to the expected changes of the participants over the course of the project, the personality characteristics of newcomers were initially determined. As these characteristics proved to be stable (Mayr, 1994), they were not surveyed again over the course of the project.

At MP 2, self-assessment of teaching and professional competences was measured again, alongside motivation and attitudes toward AS. At MP 3, focus was placed on external assessments and qualitative feedback through video recordings and observation assignments (cf. Figure 2).

Figure 2. Research design



2.3. Ethical considerations

Written, informed consent was obtained from all participants, and they were informed about the voluntary nature of their participation and their right to withdraw at any time. The data were anonymized and exclusively used for research purposes, in accordance with current regulations on data protection.

3. Results and discussion of the research question/hypotheses

3.1. Analysis of the confounding variables

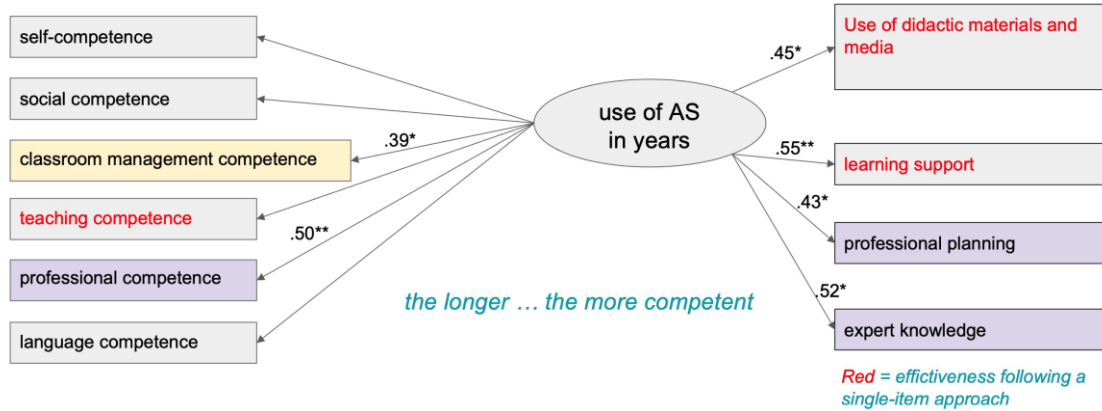
Personality characteristics such as social agreeableness ($M=2.56/SD=.8$), extraversion ($M = 1.79/SD = .93$) and openness ($M = 1.72/SD = .99$) are above $M = 1.5$ on the 4-point scale. Conscientiousness ($M = 1.33/SD = .86$) is just below, neuroticism ($M = .99/SD = .77$) hardly plays a role and thus present a minimal risk of bias. The survey on well-being shows positive values: vigour and energy ($M = 3.14/SD=.5$), enthusiasm ($M = 3.38/SD = .45$), as well as joy, happiness and pride ($M = 3.42/SD = .49$) are at the upper limit, indicating a positive baseline. Therefore, negative aspects such as neuroticism and a lack of well-being did not affect the survey results.

3.2. Research question and hypotheses

Research question 1 can be answered in several steps:

Longer-term use of the materials (more experience) is reflected in a higher self-assessment of one's own classroom management and subject expertise (cf. Figure 3).

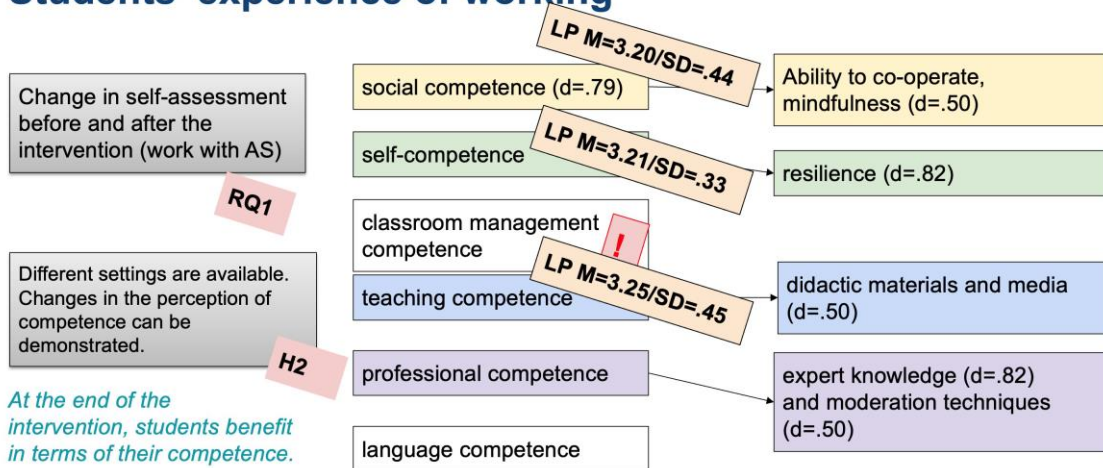
Figure 3. Relationships between longer experience and competence assessment



The red areas in Figure 3 on teaching competence follow a single-item approach. Experience with the materials (AS) leads to a higher assessment of learning support and the use of didactic materials. After the intervention (AS in the exploration setting, cf. Figure 4), teachers show no changes in their own competences. Students experience positive changes in social competence (Cohen's $d = .79$) as well as resilience ($d = .82$), use of didactic materials ($d = .5$), specialised knowledge ($d = .82$), and moderation techniques ($d = .5$) (cf. Figure 4).

Figure 4. Experienced skills acquisition by students

Students' experience of working



Students show no improvement in terms of classroom management and language competence. This may be due to the prescribed settings (by practice teachers), which offer little room for change. Qualitative feedback shows that the materials (AS) are initially used by students for orientation, but that opportunities are later recognised in targeted topic-specific work or observation and transparent counselling sessions. The materials are particularly suitable for practical counselling settings. Students report an increase in social, personal, teaching and professional competence. The final external assessment by teachers emphasizes the benefits, particularly in the areas of teaching ($M = 3.25/SD = .45$), self ($M = 3.21/SD = .3$), social ($M = 3.2/SD = .44$) and language competence ($M = 3.08/SD = .65$). These findings are in alignment with earlier evidence demonstrating that structured reflection, anchored in a clear pedagogical framework, significantly contributes to teacher growth (Shulman, 1986, p. 9). Integrating reflections on content knowledge, didactics,

and suitable technological resources, participants in our study effectively extended their competences across a range of domains, including classroom management, subject expertise, and communicative skills. This dynamic has also been highlighted in TPACK-based literature (Koehler et al., 2013, p. 15).

Concurrently, some participants noted the additional time investment required to master and implement the Analysis Sheets (AS), echoing concerns about the complexity of enacting a rich blend of pedagogy, content, and technology (Loughran, 2002, p. 36). Notwithstanding these challenges, the outcomes of the project demonstrate that a methodical observation and reflection, grounded in PCK/TPACK principles, fosters a more adaptive and responsive approach to teaching, ultimately benefiting learner engagement and competence development.

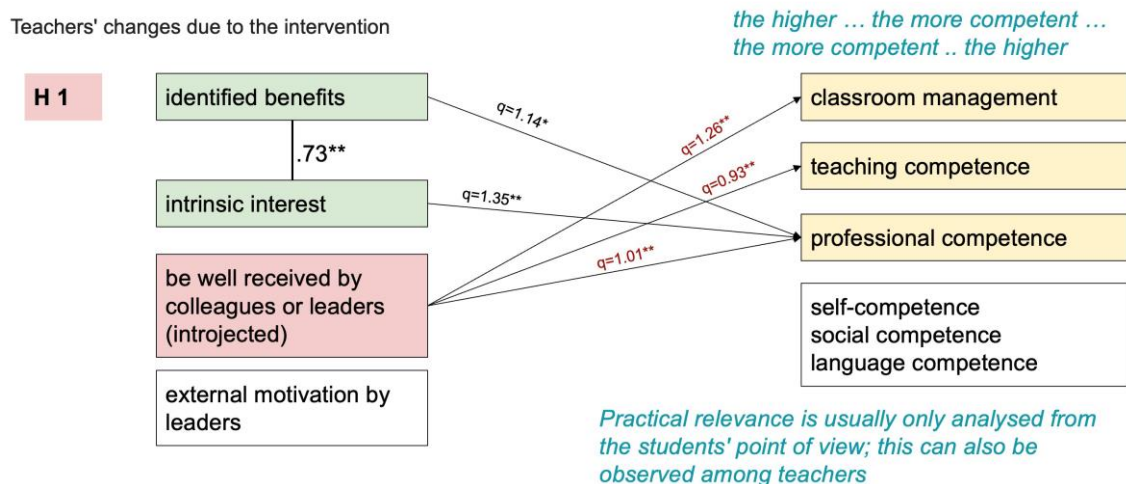
Hypothesis 1 is to be tested using the items on motivation regulation. Teachers and students who see a benefit in working with the materials are more likely to acquire relevant competences.

The analyses show that teachers who recognise the value of participating in the project rate their classroom management ($r = .39^*$), teaching ($r = .48$) and professional competence ($r = .50^{**}$) higher than their colleagues with different levels of motivation regulation. One exception is the correlation between external motivation by the head teacher and teaching competence ($r = .44$). The high correlation between intrinsic interest and identified benefit is particularly noteworthy. Nevertheless, it can be seen that the identified benefit is the decisive component in the acquisition of competences, a phenomenon that is normally only to be found in students (Seyfried & Seel, 2005), but also applies to the teachers in this study.

Furthermore, it should also be pointed out that the motivation regulation of students and teachers in different counselling settings and the associated assessments of competence also change during the course of the intervention.

Teachers who recognise a benefit of the materials experience an increase in their professional competence (Cohen's $q = 1.14^*$) with a high effect size after intensive work in various consultation settings. This is particularly true for teachers with an intrinsic interest in the materials ($q = 1.35^{**}$). Even with introjected motivational regulation (e.g. participation in order to be popular with colleagues), teachers show a self-reported increase in classroom management ($q = 1.26^{**}$), teaching ($q = 0.93^{**}$) and subject knowledge ($q = 1.01^{**}$) with considerable effect sizes (cf. Figure 5).

Figure 5. Motivation regulation and competence assessment



On the other hand, people who participate due to external motivational regulation (e.g. pressure from school management) do not show any changes in their self-assessed competences. This applies to the areas of personal, social and language competence.

Hypothesis 2 can only be tested to a limited extent due to the small sample size. However, it can be seen in Figure 4 that the sum of the settings in the intervention study, consisting of two measurement points, leads to medium/large effect sizes for increases in self-assessment and external assessment in the areas of social, personal, teaching and professional competence. The final survey of teachers regarding the progress of their students in the project (cf. Figure 4) indicates that reflection (self, peer and reflection with practice teachers) and counselling with the help of the materials provided (AS) can be considered particularly effective in the acquisition of skills.

Hypothesis 3 focusses on the linguistic component, verified by video recordings and open questions on the challenges and opportunities when using the materials (AS). Differences between schools with German as a native language and German as an additional or second language were identified. For example, language-sensitive questionnaires from Finland are difficult to use in mother-tongue German schools in Mallorca, Spain, while the materials (AS) from the Ludwig-Maximilians-University Munich, Germany (LMU) are perceived as easy to use.

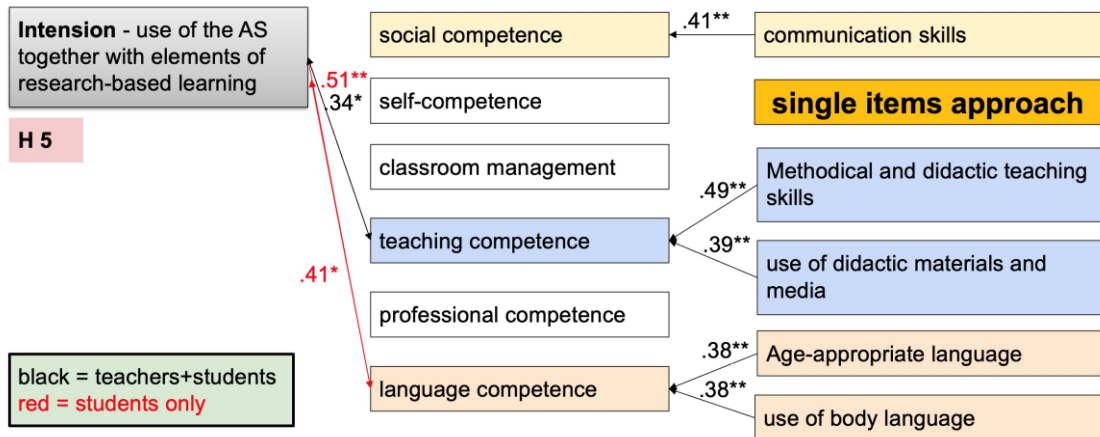
There are also challenges in special needs education and primary education, where not all materials (AS) can be applied across the board. Particularly in the area of individualisation, the practical teacher's own initiative is required. Further challenges arise in the interaction between universities and practical school studies, as there is often a lack of relevant didactic constituents in the initial phase of university training (introductory courses). However, the AS deal with these didactic principles, models and concepts, which is not always understood by the students. In addition, other universities prepare their own observation forms or planning aids, which means an additional workload for the students and mentors.

Hypothesis 4 considers the role of the AS in the process documentation. 76.9% of the participating teachers used the materials often, sometimes or rarely for project documentation. They rated the suitability for project documentation on a 4-point Likert scale with an average of $M = 3.2/SD = .77$. This reflects the use of the AS in process documentation as an effective means of developing students' professional competence. However, the teachers' assessment only shows a medium correlation in the area of further development of language skills ($r = .64^{**}$). Self, social, classroom management, teaching and subject competence are not affected. This could possibly contradict expectations and relativise the role of process documentation in the development of professional competence.

Hypothesis 5 concerns teachers and students who are willing to integrate elements of research-based learning into their training or further development. The following elements of research-based learning were used for this study: critical friends, self-determination/organisation, critical reflection phases, independent planning and further literature research.

Students who are prepared to use elements of research-based learning rate their competences in teaching ($r = .51^{**}$) and language use ($r = .41^*$) higher. For teachers, this correlation can be seen in the assessment of teaching competence ($r = .34^*$).

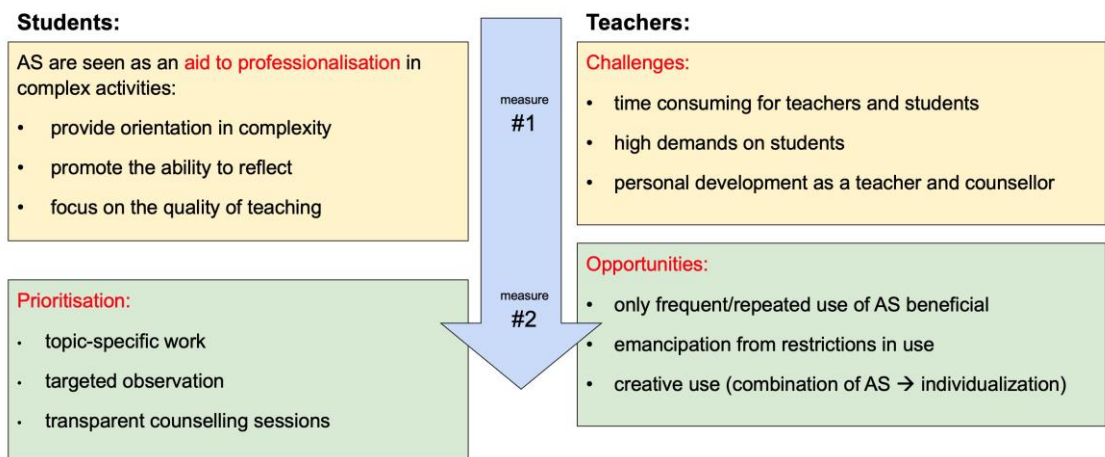
Figure 6. Elements of research-based learning



In an international and intercultural context, the self-perception of competence in communication skills ($r = .41^{**}$), methodological-didactic teaching skills ($r = .49^{**}$), handling didactic materials and media ($r = .39^{**}$), age-appropriate expression and body language ($r = .38^{**}$) correlates with an increased willingness to integrate research-based learning into the training and the development of professional competence.

The evaluation of the open questions on impressions, challenges and opportunities when working with the AS revealed the following (cf. Figure 7): The AS serve students as an aid to professionalisation and orientation in pedagogical complexity. They promote reflection and focussing on the quality of teaching. After the intervention, students appreciate the topic-centred work, targeted observations and transparent consultations. The work increasingly includes elements of research-based learning.

Figure 7. Summarized qualitative results students and teachers



Before the intervention (cf. Figure 7), teachers recognize challenges such as increased time expenditure and high demands on students. After the intervention, they recognize more opportunities, especially in counselling settings. Through frequent use, they emancipate themselves, select appropriate materials and use them creatively according to individual needs. This self-determined use of materials (AS) also helps them to fulfil the requirements in the special needs education area.

Despite its effectiveness, the present study demonstrates several methodological limitations. The non-randomised sampling approach and heterogeneous cultural contexts restrict the generalizability of the findings, and when assessing teacher motivation, regulation and competence self-assessments, potential social desirability bias must be considered. Language barriers and varying institutional frameworks may have additionally influenced the reliable implementation of the AS approach. Future studies should incorporate a broader sample of different school types and place increased emphasis on psychometric testing of AS instruments across diverse national and cultural contexts. It also might be useful that longitudinal studies are conducted over multiple semesters in order to achieve a more comprehensive capture of the sustainability of effects. Furthermore, the implementation of a systematic control of linguistic and institutional influencing factors would serve to strengthen the validity of the results.

4. Summary and conclusion

By offering practical, evidence-based guidance, this study underscores the potential of standardized yet adaptable instruments (AS) to enhance teaching quality in diverse educational settings. To summarize, it can be said that

- the work with the AS provided has positive effects in all areas of competence analyzed according to self-assessment and external assessment;
- only prolonged use of the AS is positively related to classroom management and subject competence;
- according to their own statements, students benefit particularly in the areas of communication skills, resilience, handling didactic materials, specialized knowledge and moderation techniques;
- the practical relevance of working with the AS is also crucial for teachers. Intrinsic and introjected motivation begins to take effect as the work progresses;
- teachers who feel competent in classroom management are more willing to integrate elements of research-based learning in different settings;
- students in research-based learning settings benefit from higher teaching and language competences and vice versa: higher competences lead to a greater willingness on the students' part to participate in research-based learning settings;
- the AS initially offer and serve students as an orientation aid in the complexity of teaching situations but are subsequently used for focused development goals;
- at the beginning of the intervention, teachers perceive challenges in working with the AS, but later see opportunities in the possibility of creatively adapting and using them according to individual needs.

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