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Research Article

Changing Competences: Flipped Classroom and the Challenges in Teacher Training

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Abstract: The flipped classroom teaching concept is considered innovative because it changes the traditional teaching structure and creates more space for active learning processes. At the same time, it also requires other competences from teachers. In this article, a survey is conducted with 18 student teachers in mathematics in order to record their views on the necessary competences and challenges of the flipped classroom concept and to derive recommendations for teacher training. The aim of this study is to analyse the self-assessment of student teachers with regard to their future role and the competences required for the flipped classroom. Essentially, this shows that the student teachers have a positive attitude towards the flipped classroom concept. The students emphasise the need for assessment and media skills among teachers as well as the challenges posed by the increased planning effort and communication requirements towards parents and school management. Although the results are limited due to the small and unbalanced sample, they offer approaches for teacher training in order to better prepare future teachers for innovative teaching methods. There is a call for teachers to act more as learning facilitators and in particular to develop technological, media didactic and assessment skills. This exploratory study emphasises the need for further research and curriculum adaptation in teacher education.

***Keywords*:** flipped classroom, competences, teacher training, student teachers

1. Introduction

The flipped classroom concept has been gaining popularity worldwide and in Germany in recent years as part of the broader trend towards innovative and student orientated teaching methods (Bhagat et al., 2016; Cevikbas & Kaiser, 2020; Lo & Hew, 2017; Spannagel & Werner, 2018). In response to the changing demands of the educational environment, it reverses the traditional sequence of didactic actions by allowing learners to develop new content independently. The aim is to utilise class time more effectively for processes such as exercises, consolidation and collaboration (Bergmann & Sams, 2012; Schäfer et al., 2012). In particular, this approach allows more time for active learning processes in the classroom (Bergmann & Sams, 2012; Schäfer et al., 2012; Lo & Hew, 2017). The flipped classroom can be described as a teaching concept that encompasses the didactic design of lessons, including the structure, methods and media used to impart knowledge.

Pedagogical literature attributes didactic advantages to the concept, such as an increase in learning motivation in mathematics lessons (Bhagat et al., 2016), a strengthening of the perception of competence and the experience

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of autonomy (Dierdorp, 2021) as well as an optimisation of self-organisation and time management (Zickwolf & Kauffeld, 2019). In addition, some empirical studies confirm a significant increase in learning performance (Bhagat et al., 2016; Jarrah & Baki Mohammed Diab, 2019; Katsa et al., 2016; Wei et al., 2020). Teachers report that they find the flipped classroom concept useful for differentiation in lessons. It gives them more opportunities to respond to students' individual learning needs and speeds (Spannagel & Werner, 2018).

It should be noted that the planning and implementation of the teaching concept confront teachers with a change in their teaching role and thus changes in the necessary competences (Bergmann & Sams, 2012; Handke, 2019; Lockwood, 2014; Schmidt, 2018; Spannagel & Werner, 2018). The results of a quantitative study in Spain show that less than half of the teachers surveyed (out of a total of 1,743 teachers) have the skills to adequately develop lessons based on the flipped classroom concept (Moreno-Guerrero et al., 2021). It can be concluded from these findings that the didactic concept tends to bring new challenges for teachers. Although the flipped classroom concept offers numerous didactic advantages, its implementation requires teachers to consider a variety of aspects (Sousa et al., 2024). However, studies show that many teachers are not sufficiently prepared to effectively integrate this method into their lessons (Moreno-Guerrero et al., 2021). This raises the question of what skills are required and how trainee teachers perceive their own role in this model. Against this background, this article examines how student teachers assess their own role and the competencies required to implement the flipped classroom approach. In particular, it analyzes the extent to which they feel prepared for the new requirements. Student teachers were surveyed to answer this question. The methodological approach is described in detail in the following section.

2. Theoretical background

2.1 *Flipped classroom*

The concept of the flipped classroom reverses the conventional functions of classroom teaching and homework: Instead of practising content introduced in the classroom at home, learners prepare independently at home and use attendance time for in-depth study (Bergmann & Sams, 2012). The teaching concept is also referred to in the literature as inverted classroom or flipped learning. Preparation through homework is done independently and serves to develop new topics (Schäfer et al., 2012). The flipped classroom is therefore based on the concept of self-directed learning. Students can explore the content at their own pace. This enables, among other things, the repetition or skipping of learning content (Schäfer et al., 2012). The approach also helps to address different learning needs and enables a choice of favoured media presentation (Morisse, 2019).

Outsourcing the teaching of content allows more time to practise, consolidate, and apply previously learnt content during face-to-face lessons (Zickwolf & Kauffeld, 2019). This means that the time spent together in class can be more active, interactive and individualised (Koeber & Zorn, 2018; Lage et al., 2000). Learners can also benefit from an extended range of help and support. For example, individual counselling times can be offered by the teacher (Schäfer et al., 2012). Overall, the time that learners and teachers spend together in class is seen as a valuable opportunity that should not just be used to impart knowledge (Morisse, 2019).

However, the didactic advantages of the flipped classroom approach require teachers to adopt a positive attitude towards this concept and to have the necessary didactic and methodological skills to successfully plan and implement it.

2.2 *State of research on the flipped classroom teachers and teacher training*

The teaching concept of the flipped classroom has often been analysed from the learner's perspective. In the following section, the investigation will focus on findings from the teachers' perspective and highlight the implications of this teaching strategy for the teaching staff.

Firstly, several studies have already shown a positive attitude of teachers towards the flipped classroom teaching concept (Abar & Moraes, 2019; Kazu & Yalçin, 2022; Muir & Chick, 2014; Rudd et al., 2017; Şen & Hava, 2020; Spannagel & Werner, 2018; Unal et al., 2021). Mathematics and science teachers in particular appear to be open to the concept, while teachers in subjects such as social studies and English are more reluctant (Unal et al., 2021).

Within the scientific discourse, various advantages of the concept can be identified from the teachers' perspective.

Avery et al. (2018) reports a strengthening of the relationship between learners and teachers. Student teachers recognise specific strengths in the teaching model, which include increased flexibility and effectiveness in extracurricular activities, the multiple usability of video lectures, the promotion of in-depth and collaborative learning during face-to-face time, the increased engagement of teachers in in-class activities and an effective response to the challenges posed by the COVID-19 pandemic (Han et al., 2024).

However, it is clear that planning and implementing a lesson based on the flipped classroom concept requires many skills on the part of the teacher. It is essential that precise learning objectives are set for the lessons, that home lessons are carefully designed and that parental participation is included to promote in-depth learning of the content at home (Oyola, 2016). The positive effect on performance also depends heavily on good differentiation and personalisation of lessons (Oyola, 2016; Unal et al., 2021). In addition, the actual concept of the flipped classroom and the associated expectations of the learners should be communicated by the teacher (Avery et al., 2018).

The results of Unruh et al. (2016) indicate that teachers who have established the flipped classroom have a higher teaching efficiency with regard to technology, a higher level of confidence in using it, a higher frequency of use and a more positive attitude towards technology.

There are indications that teachers who are particularly successful in a traditional teaching environment are not necessarily the most successful teachers in a flipped classroom environment (Buhl-Wiggers et al., 2023). Furthermore, some teachers reveal a certain scepticism regarding the implementation of the flipped classroom concept in their teaching practice. Reasons given include a possible increase in planning and preparation efforts or a lack of digital skills (Meyliana et al., 2022; Polly et al., 2018; Røkenes et al., 2022). This phenomenon can also be observed among student teachers. While over 70% of them stated in a study that they would attend another course within their degree programme using the flipped classroom concept, only around 41% stated that they would use the flipped classroom themselves in their lessons (Han et al., 2024). The student teachers see the following challenges of the flipped classroom: accountability to parents and school management, questions cannot be answered immediately, increased workload for student teachers, high demands for teachers and lecturers (Han et al., 2024). Overall, it is evident that many teachers still need to develop the necessary skills and in-depth knowledge of the teaching concept to effectively apply the flipped classroom in order to meet the challenges that arise (Moreno-Guerrero et al., 2021; Unal et al., 2021).

Although the flipped classroom concept offers great potential for school education, there is a lack of comprehensive knowledge about the extent to which teacher training specifically prepares future teachers for its implementation (Han & Røkenes, 2020). In particular, it is unclear which specific skills prospective teachers consider necessary and to what extent these are sufficiently promoted in their training. Existing research often focuses on the effectiveness of the flipped classroom for learners, while the perspective of future teachers and their preparation for this teaching method have so far been insufficiently examined. Therefore, this study analyzes which competencies student teachers consider necessary for the successful implementation of the flipped classroom approach, based on the results of a questionnaire survey.

3. Empirical investigation

3.1 *Research objective and research question*

The research landscape on teachers in the flipped classroom shows that there is still potential in teacher training to deal more specifically with the skills that teachers need to successfully implement this teaching concept. A particular focus here is on the challenges that arise when acquiring the skills required for the flipped classroom. Student teachers were chosen as the target group for this study, as their skills development is significantly influenced by university teacher training. Through their perspective, potentials and possible deficits in the training can be specifically identified. In contrast to teachers who are already practising, who often develop their skills through experience, this study provides information on the extent to which prospective teachers are prepared for the requirements of the flipped classroom approach at an early stage. Against this background, the following research question is central:

How do student teachers in Germany assess their role and the skills required to implement the flipped classroom?

The aim of this study is to analyze the self-assessment of student teachers with regard to their future role and the competencies required for the flipped classroom. In this explorative research approach, open questions from a questionnaire are systematically evaluated. The aim is to investigate which challenges are already apparent during

teacher training and to what extent these prepare students for later teaching practice.

3.2 *Sample and research framework*

A total of 18 student teachers from the University of Hildesheim who are studying for a polyvalent 2-subject Bachelor's degree in mathematics took part in this study. All students attended the didactic seminar on the flipped classroom in mathematics lessons. The students are between 21 and 50 years old, with an average age of 26.25 years. The participants were enrolled in semesters two to nine, distributed as follows: one student each in the second and ninth semesters, two in the third semester, four in the seventh semester, and the majority-ten students-in the fifth semester. This distribution reflects that the students were at different stages of their teacher training, with varying levels of experience and exposure to pedagogical concepts, which may have influenced their perceptions of the Flipped Classroom approach.

It should be noted that this small sample offers a limited opportunity to generalize the results, as the number of participants and the different semesters of study could have an influence on the results. Nevertheless, it makes sense to examine a seminar in the context of the teacher training program, even if students from different semesters participate. The different semesters do not represent an insurmountable obstacle, but rather offer the opportunity to compare the perspectives of students with different levels of experience and knowledge. By including students from different semesters, a wider range of impressions and evaluations are gathered, providing valuable insights into the learning process and the development of flipped classroom skills. This diversity of perspectives helps to gain a more comprehensive assessment of teacher education with regard to the flipped classroom, even if the sample is small.

During the seminar, students learned about the concept of the flipped classroom both theoretically and practically. In the theoretical phase of the seminar, the basics of the flipped classroom were taught, including the didactic principles and practical application in mathematics lessons. In the practical phase, the students worked in tandem and planned and presented a lesson on a mathematical topic of their choice in the seminar, which they designed according to the flipped classroom concept. This gave them the opportunity not only to learn the concept, but also to apply it directly and gain practical experience in lesson design. This mixture of theoretical knowledge and practical application enabled the students to develop their own perspectives and opinions on the implementation of the flipped classroom and express them in the survey.

3.3 *Questionnaire design*

The survey was conducted using an anonymous questionnaire. The reason for this was to counteract possible distortions for reasons of conformity and sympathy towards the lecturer and to obtain the most honest answers possible with this survey method.

The questionnaire consisted of 12 items. The first five dealt with biographical data of the students such as age, gender, semester, other subject and school specialisation. This was followed by three items that were rated on a five-point Likert scale. Firstly, students were asked about their previous experience with the flipped classroom concept before the seminar and their assessment of it. The students were then asked to assess their skills in planning and implementing regular mathematics lessons and lessons based on the flipped classroom concept. A five-point Likert scale was used for this purpose, with the following levels: poor, rather poor, average, good and very good. This has the advantage for the self-competence assessment of expressing one's own opinion in a nuanced way with clearly defined gradations. The middle option serves as a neutral anchor. In addition, there were four open questions in the questionnaire, which could be answered using a free text field. The format of the open questions was chosen in order to be able to analyse new perspectives as comprehensively as possible. They are intended to help obtain answers without bias by avoiding steering respondents in a predetermined direction (Züll & Menold, 2019). In this context, a survey was conducted to record students' attitudes towards the flipped classroom concept. In addition, the competences and characteristics that students consider crucial for successful teaching in this concept were determined. Their view of the role of the teacher in the flipped classroom was also compared with that in traditional mathematics lessons. At the end of the questionnaire, students were given the opportunity to make additional comments on the use of the flipped classroom model in mathematics.

3.4 *Evaluation method*

As this research is a mixed methods design using a questionnaire, both quantitative and qualitative analyses were carried out. The eight quantitative items were initially analysed descriptively in order to present the most important characteristics of the sample clearly with the help of a summary approach and information reduction (Raab-Steiner & Benesch, 2015). This includes the frequencies and, if possible, the calculation of arithmetic mean values. To compare the self-assessment of the student teachers' competences from regular mathematics lessons and the flipped classroom concept, a paired t-test was also calculated for these two items using the statistics programme R (Luhmann, 2020).

A qualitative content analysis according to Mayring is applied to analyse the four open questions. In this method, text data is systematically examined in order to gain deep insights into complex phenomena. The open-ended questions were designed to allow for detailed answers that allow for different perspectives. By using an inductive approach, recurring themes and patterns are identified through systematic categorization and summarization (Mayring & Fenzl, 2014). Each written response to an open question was to be coded according to its level of abstraction and represents a separate unit of analysis. The coding unit consists of a single word and the context unit refers to the complete answer to one of the open questions. If different aspects were identified in an answer, multiple assignment to different categories was permitted, but no multiple assignment of a person to the same category.

4. Results

4.1 *Attitudes towards the flipped classroom*

The students' attitudes towards the flipped classroom are largely characterised by their previous personal experiences and previous encounters with this teaching concept. In the survey, four students stated that they had no previous experience with this teaching concept. Two rated this as rather poor, five as neutral and seven as rather good. On average, this results in a neutral assessment with a positive tendency.

From the students' answers to the question 'How would you describe your attitude towards the flipped classroom in mathematics lessons?', 13 categories were extracted. These can be roughly divided into three areas: positive attitudes, specific characteristics of the flipped classroom and critical aspects and challenges. The number of assignments to a category are listed in brackets after the respective categories. In the area of positive attitudes, the category positive (13) was formed first. In addition, the categories *variety* (3), *interesting* (2) and *learner motivation* (1) were assigned here. The specific characteristics of the flipped classroom were named: Promotion of *overarching competences* (3), *more active lessons* (2), *teacher capacity for assistance* (1) and *more time in class* (1). These categories illustrate how the students imagine teaching in the flipped classroom and which aspects they particularly emphasise. In addition, some students also made critical comments on the use of the flipped classroom approach. For example, the category *critical in primary school* (1) was formed, as well as *use in secondary school* (3). Regardless of the school level, *class dependency* (2) can also be categorised. *Research required* (1) could be formed as a further category in order to further analyse the effectiveness of the teaching concept.

4.2 *Competences in the flipped classroom*

The following section analyses the participants' own perceived competencies and the competencies considered necessary in the flipped classroom. A paired t-test shows a statistically significant difference ($p = 0.024$) in the Likert scales used for the self-assessment of competences for planning and conducting mathematics lessons. Specifically, students rated their competences for the preparation and implementation of mathematics lessons according to the flipped classroom model significantly lower than for traditional lessons.

From this result, it can be concluded that the students judge the teaching skills required for the flipped classroom to be different from those required for conventional teaching. For this reason, the open question: 'What skills and characteristics do you consider important in order to be a successful teacher in the flipped classroom?' is analysed below. For this question, 15 categories were formed.

The students name a variety of skills that they believe teachers need to successfully implement the flipped classroom concept. The most frequently mentioned skill is *media competence* (7) in order to be able to create and

use digital learning materials. The second most frequently mentioned skill is the *assessment ability* (6). This is about assessing learning performance within the classroom. On the one hand, to assess the extent to which the concept can generally be implemented in the learning group and, on the other hand, to recognise in which areas special support is required. For example, where learning content may not have been understood. Furthermore, the *ability to plan* (5) in order to prepare lessons and materials in a meaningful way are seen as relevant. Following on from planning, the *selection of materials* (4) is frequently mentioned. In addition, *flexibility* (3) within the lesson and the ability to *communicate* (2) in order to convey the complex concept to learners and parents/guardians in an understandable way are among the necessary competences. In addition, the teacher should have a certain *openness to new ideas* (2). A further eight competences were named by one student each: c*ritical, reflective, accessibility, structured, experience, adaptability, cooperative methods* and *leading discussions*.

Overall, an overall picture emerges that identifies technical and didactic skills, planning talent, communication skills and a willingness to adapt and reflect as decisive factors for teachers in the flipped classroom concept. The group seems to agree that teachers also act as designers of learning environments and supporters of the learning process.

4.3 *Role of the teacher in the flipped classroom*

In addition to a change in competences, the flipped classroom concept also leads to a change in the role of the teacher (see introduction).

In response to the question 'How do you see the role of the teacher in the flipped classroom compared to traditional mathematics lessons?', three categories were formed that describe the traditional role of a teacher and eight categories that outline the new role of the teacher in the flipped classroom.

The traditional role of the teacher could be categorised as *imparting knowledge* (2), *explaining* (1) and *source of information* (1). The primary goal here is to impart knowledge. The teacher acts as the central source of information in the classroom, which means that teaching is largely focussed on the presentation and explanation of content.

The new teaching role was most frequently categorised as *supportive* (6). Furthermore the teacher tends to move into the *background* (4) of the actual teaching process. In addition, the category *guiding* (2) und *accompanying* (2) was formed. This means that teachers act more as learning guides and instruct students to find their own solutions and develop problem-solving and learning strategies. This would result in an *increase in trust* (1) between teachers and learners, as the teacher is perceived as a mediating and facilitating element that accompanies access to learning. A large part of the lesson preparation is seen even more in *planning and organisation* (4). This preparation of lessons is described as more *time-consuming* (2).

5. Discussion and conclusion

This article focused on exploring new challenges for teacher education arising from the competences required for the successful implementation of the flipped classroom concept. The questionnaire survey conducted among student teachers made it possible to capture a detailed picture of the perceived competence requirements. In the following discussion, the data obtained is critically analysed and placed in the context of the current state of research and the current demands on teacher training.

Overall, it can be seen that the student teachers in this sample have a rather positive attitude towards the flipped classroom concept and also express this. Some advantages are also mentioned, which are reflected in Han et al. (2024). The students state that the use of the flipped classroom model supports the development of interdisciplinary skills and contributes to a more active lesson organisation. These aspects enable in-depth and collaborative learning in classroom activities (Han et al., 2024). In addition, student teachers emphasise that there is more time available in lessons and that the teacher has more opportunities to provide support. This coincides with the characteristic of committed teachers with regard to activities accompanying lessons (Han et al., 2024). Further advantages according to (Han et al., 2024), such as the repeatable use of video lectures and the effective solution during the COVID-19 pandemic, were not mentioned by the student teachers. One reason for this could be a lack of teaching practice in which these aspects have proven useful.

Avery et al. (2018) report a strengthening of the relationship between learners and teachers through the use of the flipped classroom concept. This approach is also confirmed by the student teachers, who perceive the teacher in their

new role as a mediating element that accompanies the learners in the learning process. An increase in confidence is explicitly mentioned. The student teachers are of the opinion that the teacher in the flipped classroom concept should have good assessment skills with regard to the performance and knowledge level of their pupils. Only then is it possible for the teacher to support learners individually and differentiate lessons in a targeted manner. Sousa et al. (2024) also cite effective assessment strategies as a challenge in the flipped classroom. Teachers would have to develop new assessment methods for the teaching concept in order to assess learning success and provide prompt feedback.

Unruh et al. (2016) show that teachers who successfully implement the flipped classroom concept have a high level of media competence. This study also shows that digital media already play a central role in the general attitudes of student teachers towards the flipped classroom. Media literacy is also identified as the most frequently cited skill for the successful implementation of this teaching concept. The importance of digital skills is also reflected in previous research: a lack of digital skills is cited as a key barrier to the application of the flipped classroom approach (Meyliana et al., 2022; Polly et al., 2018; Røkenes et al., 2022; Sablić & Mirosavljević, 2024). This suggests that targeted promotion of media literacy in teacher training could be crucial to support the dissemination of this concept.

Another challenge mentioned in the literature is the increased planning and preparation effort (Røkenes et al., 2022; Sablić & Mirosavljević, 2024). The aspects of planning and organisation as well as a possible higher expenditure of time are also mentioned by the student teachers in the role of the teacher in the flipped classroom. While Sablić & Mirosavljević (2024) further subdivide this into the creation of videos, the design of creative learning environments and active learning, the student teachers do not specify planning in this way. However, the following categories are found in the competences considered necessary: selection of material, cooperative methods and leading discussions. This indicates that student teachers consider these competences to be important, but do not explicitly perceive them as part of the planning effort. This could indicate that they associate planning with organisational aspects rather than didactic decisions. It would be interesting for future research to investigate how student teachers specifically define the planning process in the flipped classroom and which aspects they (un)consciously include.

Han et al. (2024) cites accountability to parents and school management as one of the challenges of the flipped classroom. This results in a high level of communication skills about the teaching concept, which the participants in this study stated as a necessary competence. The other challenges according to (Han et al., 2024): Questions cannot be answered immediately, increase in workload, high demands on teachers and lecturers are not explicitly reflected in the responses of this study. A newly identified aspect that was not previously found in the literature is class dependency and the observed tendency to want to apply the teaching concept less in primary schools and more in lower secondary schools. When interpreting this result, however, it should be borne in mind that the data is based on a small sample and also shows an overrepresentation of prospective primary school teachers. This could have led to a bias, as the specific curricula and teaching methods of primary schools may be perceived by students as less compatible with the flipped classroom concept. Further research is therefore needed to investigate the extent to which this class dependency can be generalised and which framework conditions may influence it.

A major limitation of this study is the small sample size of 18 participants. This considerably limits the generalisability of the results to a larger population of student teachers or teaching staff and underlines the exploratory nature of the study. In addition, the sample has an unequal distribution in terms of gender (14 women, 4 men) and school specialisation, which can lead to potential distortions in the results. Another aspect is the composition of the sample: all participants are studying mathematics and have taken part in a special seminar on the flipped classroom. On the one hand, this represents a possible bias, as the students may have a more positive attitude towards the concept due to their interest and active engagement with it. On the other hand, it offers the advantage that all participants have a comparable knowledge base on the flipped classroom and have gained both theoretical and practical experience with the method. This allows the study to specifically investigate which competences student teachers consider necessary after such an introduction. The small number of participants is also due to the fact that seminar places are limited, which made a larger sample within this research design impossible. Nevertheless, the study offers valuable insights into the perceptions and competence requirements of student teachers in the context of the flipped classroom. It provides initial indications of potential challenges in teacher training and highlights aspects that should be further investigated in future, more comprehensive studies. In particular, it can provide impulses for the design of teacher training curricula in order to better prepare students for innovative teaching concepts. The results should therefore be seen not only as a pure research exercise, but also as an important contribution to the discussion on the integration of the flipped classroom approach

into teacher training.

Overall, the literature shows that many teachers still need to expand their knowledge of the flipped classroom concept in order to successfully overcome the associated challenges (Moreno-Guerrero et al., 2021; Unal et al., 2021). It has also been found that successful teachers in traditional teaching are not automatically successful in the flipped classroom (Buhl-Wiggers et al., 2023). These findings indicate that the flipped classroom model not only requires methodological adaptation, but also new didactic and organisational skills. The student teachers in this study also rated their skills in planning and implementing a flipped classroom lesson as significantly lower than their skills in traditional lessons. This illustrates that there are already uncertainties in dealing with this teaching method during training. Sousa et al. (2024) also emphasise the need for continuous professional development in order to update and further develop the skills required for the flipped classroom. In active teaching, however, this can present an additional challenge due to the already high workload. This results in a particular need for action in teacher training: If future teachers are prepared at an early stage to plan and implement innovative teaching concepts, this can not only increase their confidence in using these methods, but also improve the quality of teaching in the long term. A targeted integration of the flipped classroom concept and the associated skills into university education could enable student teachers to acquire a broader range of skills and test them in practice during their studies. This would not only reduce the need for further training later on, but would also help to ensure that innovative teaching methods are integrated more sustainably into everyday school life. Further studies are required to further analyse the existing need for improvement and to derive concrete measures to optimise teacher training.

Overall, the student teachers see the central elements of the flipped classroom in the role of the teacher, who tends to act in the background and provides support and individualised encouragement. The focus is more on the preparation of content and materials, which is why planning and organisation play a major role in the use of digital media. The key skills required to implement an innovative teaching concept such as the flipped classroom should be given greater consideration in teacher training. These include not only technological and media didactic competences, but also advanced skills in the individual assessment of learners, in adapting lessons to the specific class composition and in the design of teaching materials. The need to prepare teachers for a new role as facilitators of learning rather than as a central source of information requires a certain reorientation of pedagogical training. The present study represents an initial exploratory investigation to capture and contextualise the opinions and attitudes of student teachers. The statements and competences found here should be reviewed and differentiated in future with a larger sample of student teachers and teaching staff. In addition, study regulations could be systematically analysed and evaluated according to the competencies identified.

Conflict of interest

The author declares no competing interests.

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