The use of digital media in primary school PE – student perspectives on product-oriented ways of lesson staging

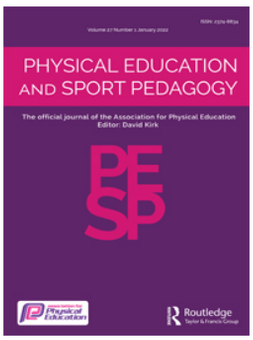
Greve, Steffen; Thumel, Mareike ; Jastrow, Florian; Krieger, Claus ; Schwedler-Diesener, Anja; Süßenbach, Jessica

Published in:
Physical Education and Sport Pedagogy

DOI:
10.1080/17408989.2020.1849597

Publication date:
2022

Document Version
Publisher's PDF, also known as Version of record



Routledge
Taylor & Francis Group

Physical Education and Sport Pedagogy

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cpes20

The use of digital media in primary school PE – student perspectives on product-oriented ways of lesson staging

Steffen Greve, Mareike Thumel, Florian Jastrow, Claus Krieger, Anja Schwedler & Jessica Süßenbach

To cite this article: Steffen Greve, Mareike Thumel, Florian Jastrow, Claus Krieger, Anja Schwedler & Jessica Süßenbach (2022) The use of digital media in primary school PE – student perspectives on product-oriented ways of lesson staging, Physical Education and Sport Pedagogy, 27:1, 43-58, DOI: 10.1080/17408989.2020.1849597

To link to this article: https://doi.org/10.1080/17408989.2020.1849597

Published online: 20 Nov 2020.

PHYSICAL EDUCATION AND SPORT PEDAGOGY
2022, VOL. 27, NO. 1, 43–58
https://doi.org/10.1080/17408989.2020.1849597

Routledge
Taylor & Francis Group

The use of digital media in primary school PE – student perspectives on product-oriented ways of lesson staging

Steffen Greve [a], Mareike Thumel[b], Florian Jastrow[c], Claus Krieger[d], Anja Schwedler[e] and Jessica Süßenbach[a]

[a]Institute for Physical Activity, Sports and Health, Leuphana University Lüneburg, Universitätsallee 1 Lüneburg, Germany; [b]Institute for Educational Science, Friedrich-Alexander-University of Erlangen-Nürnberg, Nürnberg, Germany; [c]Future Centre of Teacher Education, Leuphana University Lüneburg, Lüneburg, Germany; [d]Working group Physical Activity, Games and Sports, Universität Hamburg, Hamburg, Germany; [e]Profile study Digital Teaching and Learning, Leuphana University Lüneburg, Lüneburg, Germany

ABSTRACT

Background: There is a controversial debate about the use of digital media in physical education. There are various research results, which mostly do not relate to primary school, however. There are no known studies showing how media educational goals can be integrated into physical education. Our contribution takes this desideratum as its starting point. Taking both current discussion lines in sports pedagogy about physical education in elementary school and the basic assumptions of media education into account, we designed, implemented and evaluated teaching units for the use of digital media in physical education.

Purpose: This occurred with regard to the research question of how students in elementary school interpret and experience the use of digital media in physical education when media educational goals and objectives of physical education are addressed equally. This raises the question which opportunities and limitations for educational processes (with regard to movement education, general education and also media education) can be reconstructed.

Method: To address the question of students' perspectives and interpretations on the usage of digital media in physical education, tablets were used in the PE classroom of four primary school classes over the period of one school year. Lessons were developed and carried out in which students were tasked with creating media products using the tablets and the iMovie app. The teaching units were evaluated afterwards based on the research approach of focusing on the perspectives of the students involved. For this purpose, we conducted and analyzed 39 guided interviews with the students after each lesson. The data was analyzed using the grounded theory methodology.

Findings: From the analysis of the interviews we developed a category system that describes phenomena of an extended range of access to the experience of physical activity in PE. These are captioned using the categories 'New creative roles and tasks' (which is divided in the two subcategories 'The empowered camera child' and 'The cool actor') and 'Focused products' (which is divided in the three subcategories 'Re-recording of a product', 'Improving and developing the product', and 'Appreciation and recognition of the product'). The results show that the children's main focus is on their experience of movement.

ARTICLE HISTORY
Received 9 July 2020
Accepted 2 November 2020

KEYWORDS
Digital media; primary school physical education; PE; Qualitative social research; Grounded Theory

CONTACT Steffen Greve steffen.greve@leuphana.de Institute for Physical Activity, Sports and Health, Leuphana University Lüneburg, Universitätsallee 1, 21335 Lüneburg, Germany

Conclusion: The use of digital media opens up new possibilities in the context of learning and experiencing movement. Besides the function of learning with media, the use of digital media in physical education also means that students learn something about media, for example when the use of media generates personal data that the students and teachers work with. Whether the use of digital media can be beneficial for physical education classes thus depends on the design of the lesson itself.

1. Introduction

There is a controversial debate about the use of digital media in physical education. While some authors point out the risks and problems of using digital media (Gard 2014; Lupton 2015), others emphasize the potential of using digital media in physical education (Casey, Goodyear, and Armour 2017). There are several research results in this field for secondary school (Bodsworth and Goodyear 2017) but hardly any specific research activities and results for primary school. No research results at all are known about the equal combination of media educational and physical educational goals and content. There are many publications on examples of lessons in which digital media are intended to support the sports-specific learning of children at school, media-educational demands, however, are usually ignored or neglected (Greve et al. 2020). This seems problematic since digital media with all their possibilities and challenges are an important part of the current living environment of children. This has a corresponding impact on schools and the physical education classes that takes place there (Bodsworth and Goodyear 2017). Digital media are more and more part of children's learning processes and support them. In addition, it has become the task of schools to prepare children for our deeply mediatized world (Couldry and Hepp 2013). In this respect, it is important that children learn to use digital media technically. But other components, such as dealing with pictures and videos of oneself and others, are also important topics in media education.

Our study takes these described circumstances as a starting point. Taking both current discussion lines in sports pedagogy on physical education in primary school (Neumann and Balz 2020) and basic assumptions of media education in Germany (Tulodziecki, Herzig, and Grafe 2019) into account, we designed, implemented and evaluated teaching units for the use of digital media in primary school physical education. Demands and objectives of physical education and media education were equally taken into account (Greve et al. 2020). In Germany, media education was not set up as an independent school subject, but is part of the educational mandate across all subjects (Kultusministerkonferenz 2017). Of particular interest are the students' views and interpretations as actors in their own educational process. While there is already a small amount of data on the perspective of teachers on physical education designed with the help of digital media, data on the students' perspective in the context of primary school are not yet available. In order to approach this desideratum on a theoretical and practical level, we will first present the state of research on the use of digital media in physical education, with a special view on primary school physical education. After that we look at the specific discussion in Germany. On the one hand on primary school sports lessons, on the other hand on the promotion of media competence in elementary school. This is due to the fact that we have designed, implemented and evaluated teaching concepts based on German curricula. We will continue by presenting our methodological approach as well as the results of the study, and conclude by discussing the results.

2. Digital media in physical education

Digital media are now a natural part of children's everyday lives. It is the task of schools to prepare children for our deeply mediatized world (Couldry and Hepp 2013). The development of various competences on media and on dealing with media is already a task of elementary school (Ferrari

2013). Regarding digital media in physical education at primary school, only a limited number of scientific studies are available. Therefore, we first address the general discourse on the use of digital media in physical education.

The use of digital media in physical education is controversially discussed. While some authors emphasize the risks and problems of using digital media (Gard 2014; Lupton 2015), others draw attention to the potential of using digital media in physical education (Casey, Goodyear, and Armour 2017). Bodsworth and Goodyear (2017) pointed out that digital media is part of young people's everyday lives. They should therefore be part of physical education, as they offer many learning opportunities when properly embedded pedagogically. We follow this line of reasoning at this point. There is no question that physical education is changing with the use of digital media, which Casey, Goodyear, and Armour (2016) were able to show in various case studies.

2.1 Digital media in secondary school PE classes

There are already many studies on the use of apps in the context of health in physical education (Goodyear, Kerner, and Quennerstedt 2019; Luguetti, Goodyear, and André 2019; McKenzie and Lounsbery 2013). It is interesting for our research interest that these studies show that young people are often critical of the use of digital media in physical education. This is partly due to the problem of data security. Case studies show that there are ethical issues that only arise in digital research. These issues need to be addressed in the context of research into sports and health (Goodyear 2017) and also in the context of research into PE. The question arises as to how this is possible in the context of elementary school. It is not only about the fact that sensitive data (e.g. fitness data) are used by third parties, but also about the fact that students take pictures and films of other students, view them directly in class and talk about them. This is also a sensitive issue.

In this respect, with regard to the direct organization of physical education, Goodyear, Casey, and Kirk (2014) show in a study with students from two classes of grade 10 that the roles of camerawoman and coach have to do with the engagement of girls in physical education. Some girls only take part in class when they do not have to physically participate. Instead, they have the opportunity to participate as camerawomen and coaches. This phenomenon also seems interesting to investigate in the context of elementary school.

2.2 Digital media in primary school PE classes

The existing studies from primary school often address the learning of motion sequences with the help of video recordings, i.e. 'video self-modeling': 'a form of observational learning with the distinction that the observed and the observer, object and subject, are the same person' (Dowrick 2012). Students have the opportunity to independently record, view and analyze movements in small groups. Here, physical education may benefit from the fact that the tasks can be carried out with less support from a teacher, as Koekoek and van Hilvoorde (2018) remark. As early as 2005, Hamlin described advances in technology, especially with regard to video recording, which ensure, according to his recommendations, that children can manipulate and observe their 'skill performance' and develop technical skills (Hamlin 2005). The possibility of repeated visual feedback played in slow motion leads to a more targeted practice for students (O'Loughlin, Chróinín, and O'Grady 2013). This study was conducted in a primary school in Ireland with 10 girls and 12 boys aged between nine and ten. The data were collected before and after a 10-week intervention in basketball.

In a study, Kearney and Schuck showed that lessons with the help of digital media can take place in a more self-regulated manner and thus increase fun and motivation (Kearney and Schuck 2006). The study took place, i.e. in two primary schools with pupils aged 5 to 10 and their teachers. In the course, students carried out video projects. The data was generated using open questionnaires, class observation and interviews.

O'Loughlin, Chróinín, and O'Grady (2013) were able to show that digital media help to include students into the process of self-assessment, which they perceive as authentic. Additionally, it increases the students' motivation to improve their competencies and skills. Digital media made an important contribution to involving students in the process of their own learning through immediate feedback and authentic assessments. Lee and Gao (2020) showed that short-term app-integrated interventions in PE classes have, albeit minor, influence on increasing primary school children's physical activity, psychosocial beliefs as well as self-efficacy and enjoyment compared to traditional PE classes.

Various studies deal with the teacher's perspective on the use of digital media in physical education. It is often pointed out that PE teachers are mostly giving lessons on their own; therefore it is necessary to plan the usage of digital media in a way that is easy, targeted and collaborative (van Rossum and Morley 2018). A study with 12 teachers, two of them elementary school teachers, in the New York area showed that teachers use digital media in physical education mostly if they want to expand the purpose of physical education and not replace it.

Teachers' attitudes influence the ways digital media are used in physical education. Socially oriented teachers focus more on the critical use of digital media – also in everyday life (Marttinen et al. 2020). Such a media education approach should be discussed, in addition to the approach of sports pedagogy, when planning and implementing PE lessons that are staged using digital media (Greve et al. 2020). This was also the claim of the study we conducted. As it was conducted in Germany, the lessons were of course developed, conducted and evaluated based on the German discussion about physical education in elementary school and media education in elementary school. To make this comprehensible, the different lines of discussion are introduced in the following section.

3. Physical education and digital media in Germany

Almost 3 million children attend primary school in Germany. This usually includes the first 4 years of schooling. Mostly, the students have two or three PE lessons a week. The curricula and education plans in the field of PE in Germany follow theoretical lines of education that are based on the double contract of educational sports lessons (Prohl 2006). This assignment describes two interlinked components, an 'education for sport' (movement education) and an 'education through sport' (general education). This connection is used in physical education to acquire content (in the sense of acquiring athletic skills) and, in the process of acquiring content, to attain key skills in topical general education (in the sense of personal growth) (Gröben and Prohl 2012; Prohl 2006). The specific content of physical education at primary schools is listed in the curricula and education plans of the German Federal States divided into fields of movement. This kind of division serves the purpose of expanding and opening up the necessary content (Stibbe 2011). In this way, the content and design of physical education lessons can be based on the needs of the students, and not vice versa.

In addition, the curricula and the education plans address the skills that the students need to acquire (Ruin and Stibbe 2016). These are mostly based on the six pedagogical perspectives formulated by Kurz (2009), which point out the pedagogical value of sporting activities (Stibbe 2011):

- Improving perception skills, expanding movement experiences
- Improving physical expression, forming movement
- Daring something and taking responsibility for it
- Experiencing, understanding and assessing performance
- Cooperating, competing and communicating
- Promoting health, developing health awareness.

This list highlights the educational potential of physical education. The discussion about these points repeatedly refers to the difficult relationship between the students' heteronomy and

autonomy (Schierz and Thiele 2013). On the one hand, the curricula and educational plans provide educational goals and content, on the other hand, an individual subject should (and can) only form itself. This means that the teacher can design the learning environment and thus prepare and support the learning process. The completion of the learning process, however, is dependent on the student acting accordingly as a self-forming subject (Gröben and Prohl 2012; Prohl 2006). Due to this discussion, the concept of multi-perspective sports lessons is omnipresent in German-language sports pedagogy. It stands for an orientation towards the students and for their participation in their own learning process. Schoolchildren do sports for different reasons (e.g. to compare their performance with other students, or to improve their own athletic abilities and skills or even their own health). This fact must be taken into account when designing physical education classes. In the most topical view of a multi-perspective sports lesson, Balz and Neumann (2015) advocate a flexible use of these perspectives and emphasize that they should not be rigidly adhered to, but that there are certainly variations in their number, naming and design. The growing heterogeneity of students, especially in primary school,[1] multiplies the need for these approaches substantially.

Content and options for lesson design in physical education are further influenced by social changes. This includes, i.e. the strong presence of digital media in the everyday life of children as well as the increasing number of German schools equipped with digital media. In Germany, media education was not set up as an independent school subject, but is part of the educational mandate across all subjects (Kultusministerkonferenz 2017). Therefore this is also important for physical education. Media competence is perceived as 'an essential prerequisite for a sovereign way of life, which is increasingly characterized by shaping one's own life with and via media' (Schorb and Wagner 2013, 18). With regard to schools, this is again clearly emphasized by Tulodziecki and Grafe (2013), who emphasize the importance of intertwining learning with media and learning via media. 'The processes of learning with and about media are interrelated', because 'learning with media [should] include reflective processes on the importance of media for learning and knowledge (…), and the performance of media-related educational tasks can be combined with the use of media as a learning aid (…)' (Tulodziecki and Grafe 2013).

The demand for this kind of media education was also given political emphasis. The Standing Conference of the Ministers of Education and Cultural Affairs (KMK) recommended in 2012 to include 'basic, comprehensive and systematic media education into the framework of school education' (Kultusministerkonferenz 2012, 4). However, the International Computer and Information Literacy Study (ICILS) 2013 revealed that teachers in Germany neither regularly use digital media in the classroom nor specifically promote the IT-related skills of secondary school students (Bos et al. 2014). Germany was far behind in implementing media education compared to other countries. With regard to the use of digital media in subject-specific classes in primary school, the Progress in the International Reading Literacy Study (known in Germany under the acronym IGLU) and the Trends in International Mathematics and Science Study (TIMMS) primary school comparative studies show that digital media was rarely used in Germany (Eickelmann, Gerick, and Bos 2014; Eickelmann 2014). In response to these research results the KMK submitted a resolution in 2016 that stipulated binding requirements for the implementation of digital media in schools. Six competence dimensions determine competencies that 'promote individual and self-regulated learning, strengthen maturity, identity building and self-confidence, and facilitate self-determined participation in the digital society' (Kultusministerkonferenz 2017, 14).

This competence building is expressly requested to begin in primary school. The areas of competence refer closely to the Digital Competence Framework of the European Commission (Ferrari 2013). Since the focus in Germany has traditionally been on media criticism, a sixth dimension 'Analyzing and Reflecting' (Kultusministerkonferenz 2017, 13) has been added to the Digital Competence Framework of the European Commission. This resolution assigns a special role to primary schools because the different areas of media literacy are to be promoted in a child-friendly manner, thus laying the foundations for further competence building.

With regard to the dual contract of physical education, digital media, or learning with and about media, can be helpful in promoting various principles (e.g. experience and action orientation, addressing multiple perspectives, communication, reflection) (Hebbel-Seeger, Krieger, and Vohle 2014). This was also a claim of the study described below.

4. Methodological approach

Our research question addresses possibilities and limitations for educational processes in elementary school physical education, which is staged with the help of digital media. Here, processes of movement education, general education and also media education are of interest. In order to investigate this question, the researchers developed teaching units together with teachers, which were conducted in different classes. For the development and evaluation of such units, the student perspective is of enormous importance as the increasingly digitalized world of children's lives offers important explanations for researchers and teachers (Bodsworth and Goodyear 2017). The methodological procedure was designed in accordance with the methodology of 'Grounded Theory' (Corbin and Strauss 1996). The choice of this qualitative research approach is based on the focus of the research interest on the reconstruction of the students' subjective views. In this way, student actions and teaching processes were analyzed and explained on the basis of interviews. The focus of research was thus on the subjective comprehension of individual actions (Mey and Mruck 2009) as well as on the comparison and analysis of social actions and processes (Krieger 2016). The procedure followed closely the activities of the subjects of research. A further reason for the methodological approach is the lack of theoretical treatment of the topic, which gave the research question an explorative character.

4.1 Approach in class

To address the question of students' perspectives and interpretations on the use of digital media in physical education, tablets were used in the PE classroom of four primary school classes of years 1 and 2 over the period of one school year. Lessons were developed and carried out in which students should create media products using the tablets and the iMovie app.[2] To this end, work groups of four students each were given one tablet. This combination of cooperative group work and technology can help to promote the commitment of the students (Casey and Hastie 2011). In the sports hall, an exercise area was set up with various devices (e.g. soft grounds, vaulting boxes, wall bars, gym mats, swing ropes, benches). On these devices, the students should perform movements (e.g. runs, jumps, rolls) and film each other. The students were free to choose the devices and movements, there were no specifications from the teacher. The students should coordinate their course of action in their work groups independently. Beforehand, the children had a class discussion about various film perspectives (normal perspective, worm's eye view, bird's eye view). Various functions of the app were also briefly discussed.

4.2 Data collection

The teaching units were evaluated afterwards based on the research approach of focusing on the perspectives of the students involved.[3] For this purpose, we conducted and analyzed 39 guided interviews with the students after each lesson. In a parents' evening and a letter, the children and their parents were informed about the use of tablets in class as well as about the planned interviews and their purpose. The children and parents could object to participation in the interview. The researchers observed the lessons and then selected children for the interviews. The selection was based, for example, on whether the children had worked particularly intensively with the tablet during the lessons. In addition, the researchers were able to react to teaching situations that were of interest to them and ask the children about them after class.

The interview guidelines broached the issue of how individuals experienced the teaching arrangements using tablets and included topics such as the handling of devices, the situation of being filmed, watching the media products, or the phases of the children's cooperation using a tablet.

4.3 Data analysis

Research meetings critically reflected on the procedures in the classroom as well as on the courses of action in the research process and explicitly adapted the interview guidelines. This procedure led to optimizations during access to the field. We have oriented ourselves to the coding procedures of the 'Grounded Theory (Corbin and Strauss 1996). In the investigation, we only used open and axial coding. The core category, selective coding, was not elaborated on (Corbin and Strauss 1996). The development of an object-centered theory was not the focus of our research interest. We could identify and describe phenomena and patterns of action that corresponded to our research question. Therefore, the applied coding methods appeared sufficient for the analysis of the topic at that point (Corbin and Strauss 1996). The knowledge gained after the first round of open coding and the phenomena or categories that appeared relevant (for the present) were substantiated and further differentiated by additional data collection and axial coding. The researchers jointly coded the data and discussed the results continuously. This circular process was shaped by the fact that researchers from various disciplines (sports pedagogy, media education) worked together.

5. Results: extended range of access to the experience of physical activity in the PE classroom – new roles, tasks and 'products'

From the analysis of the interviews we developed a category system that describes phenomena of an extended range of access to the experience of physical activity in PE (Figure 1).

The PE classes with tablets examined here reveal modified and, above all, expanded methods or options of access, which are captioned using the two categories 'New creative roles and tasks' and

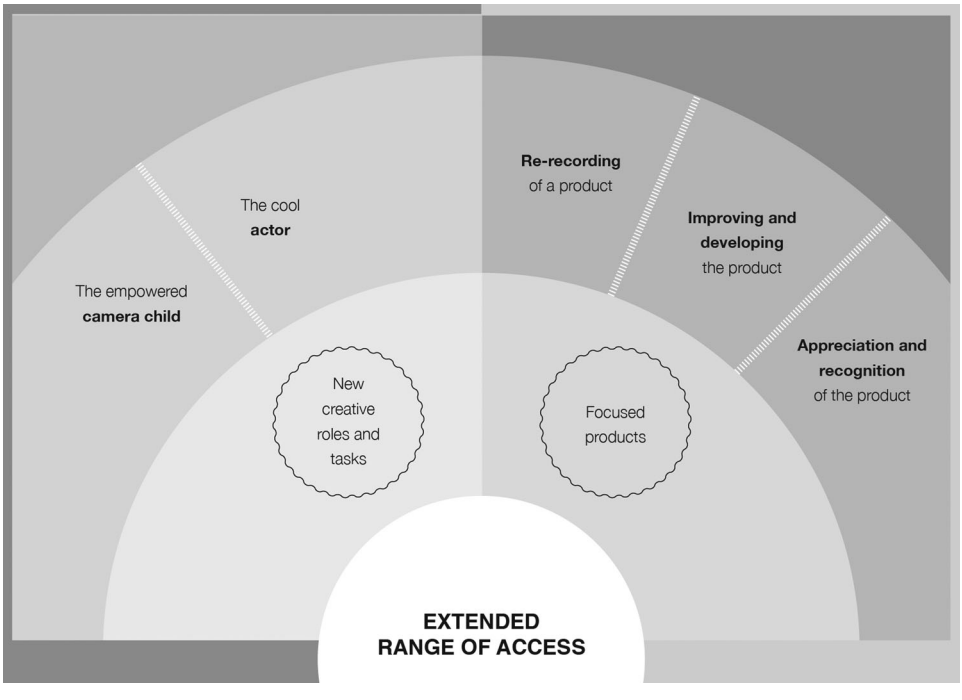


Figure 1. The category system.

'Focused products'. These two categories each consist of different subcategories (Figure 1). The five subcategories each bundle certain phenomena of the topic area targeted by the respective name of the subcategory. When presenting a subcategory, first the phenomenon in general is described. In addition, an interview example is given for each subcategory, which is typical for the phenomenon. The interview passages have the function to illustrate the phenomena treated accordingly and to enable an explication as well as an in-depth interpretation. This makes the interpretations that follow transparent and verifiable. In addition, the examples support the reader in understanding the formation of categories. The mentioned interpretations are based on the data material and on the outlined theoretical and empirical findings.

In general, it can be said that the 'extended range of access' became possible in this form because a majority of the students had already acquired sufficient media experience outside of school. This became clear in the interviews. If functions or the app were unknown, the students reported that they learned the required functions quickly and easily and received help from their classmates. The tablets were a functional part of the work process in the PE classroom that focused on the children's movements. The use of a mobile device appears to be an everyday occurrence that was not perceived as particularly unusual.

5.1 New creative roles and tasks for schoolchildren in physical education

The students interviewed described various roles that resulted from the use of tablets when staging the PE lesson. As part of the lesson, these roles intertwined the typical content of physical education with creative tasks that were influenced by media production. In this context, both positive and negative phenomena related to this coexistence became visible.

5.1.1 The empowered camera child

One example in this respect is operating the camera when filming movements. This was the task at several points in the teaching units. For this purpose, the students got to know the basics of film design by dealing with perspectives and their effects as well as with the size setting.[4] The respective camera child does not necessarily have to do sports, but has a relevant influence on the work process. The child can literally direct it and thus control the production. In many examples, the students experienced this role as unproblematic and popular. However, situations described in which the 'power' of the camera child was exploited and used negatively proved to be problematic, e.g. for Frauke.

> Frauke: As to Abdul, one thing really sucked. That he just filmed and always just pressed the button, and pressed it again and again, so we could only see very little, and he also filmed when we didn't want it. That he, that he's the one who films us.

Besides the poor quality of the recordings, Abdul's exploitation of his power as a camera child is particularly problematic for Frauke. He filmed her, from her point of view intentionally, in situations in which she didn't want to be filmed. She perceives Abdul as camera operator in an empowered role, which he uses to put pressure on the other children and maintains his position of power despite being asked to stop it. This causes a feeling of powerlessness and incomprehension in Frauke ('*he also filmed when we didn't want it … but he just did it again and again*') and had a negative impact on the overall situation. This shows a clear change in the social constellation in the PE classroom through the specific use of media: Tablets allow to record movements, which is otherwise not possible in the PE classroom. Frauke is clearly aware of the implications of filming, i.e. the possible recording of unwanted and possibly embarrassing movements. Even though the pictures taken during PE classes could not be published immediately because the tablets were not connected to the Internet, personal rights and the right to one's own image were virulent at this point and had been explicitly addressed in some teaching units (not mentioned here by Frauke in the interview). Everyone should decide

for him- or herself whether photographs of him- or herself may be published. In the case of children, the legal guardians decide. Knowledge of these rights is named as a requirement in the KMK Strategy (Kultusministerkonferenz 2017, 16), and through the use of tablets they become part of the PE classroom.

5.1.2 The cool actor

Besides the role of camera operator, the filming entails the new and possibly unfamiliar role of actor or actress. The performance of a movement is planned, carried out and subsequently assessed with the goal in mind of achieving an 'effect' according to the assignment and thus fulfilling the requirements associated with this role. Jim describes this as follows:

> Jim: It's all about finding out what was cool and what was good. Well, in our group we jumped on the ropes and when we were all together; well, I and Enno slid down a slide. And Lisa and Mona were sitting there "gangster-like" and the two of us were sliding.
> (…)
> I: Ok. And did you talk about the things that you looked at?
> Jim: A little. Yes, we look at it and then we have to improve the video scene and if we did everything well, we don't have to improve.
> I: Ok. And what are the reasons for having to improve a video?
> Jim: To make it look much better. But ours looked already pretty good. Especially in this orange slide thing, I climbed up there and when I jumped down, it was really cool.

There are other situations in physical education in which courses of action are planned beforehand, executed and evaluated in accordance with a requirement, for example a move in a sports game that should help to score goals. Here, however, the situation is dramatized and intensified. Jim describes that a '*cool*' '*video scene*' should be created. To this end, his classmates take on a '*gangster-like*' pose, the children slide down a slide and jump down from ropes. The story line was also discussed verbally. In addition, they experimented with design methods in order to achieve an effect (e.g. by using the 'low angle shot' which magnified the height of the objects from which the children jumped). Further, the children on purpose omitted to film some objects of the structure to create the impression that they came swinging from far above.

It is not uncommon for children to take on imaginative roles in physical education (e.g. famous soccer players or jungle animals) and it also happens without the addition of a tablet. However, the use of media here emphasizes the assumption of a certain role as actor. Jim mentions that he did not always wait for the camera child's announcements and its filming. At those moments, the desire to move seems to have been more influential than the filming. But much of the time, the children plan in advance which (actor) roles they design in which way in order to create an effective product, and act accordingly.

5.2 Focused products

The tablet and the specific task of shooting a 'trailer', which is transferable to the development of a choreography or the improvement of the way a movement is executed, entail the orientation towards a 'product', usually a video sequence, which accounts for the bulk of the students' interactions and negotiations. The children interviewed report in some cases very extensively about processes that are related to the recording and replaying of movement activities. Movement actions in the PE classroom are usually transient, i.e. they are carried out in a moment and can only be viewed by teachers and students in this moment. The use of tablets and apps creates opportunities to conserve this movement. A typical phenomenon is, for example, the re-recording of movements that the actors afterwards don't like any more. This is described, for example, by Sven.

5.2.1 Re-recording of a product

Sven: There are also arguments … no, I created an idea with the mountain. Piet stands here and the mountain stands here and I am there and then we can jump like that and I am here with an injured leg because I did this and now it really hurts here, so I did (…), afterwards I have seen it, and I said 'delete it' because I was running all the time and they just tease me all the time and I said 'delete that'. And then I took the tablet 'delete, delete, delete, delete'. Because he only did it with me, not with them.

The movement is viewed 'from the outside' on the tablet and assessed (also by mutual feedback) as to whether it leads or fits to the desired effect. Sven came up with an idea for a scene and describes how it can be implemented with classmates. He seems to anticipate a corresponding line of suspense, which is characterized by his simulated injury and jumps from an elevation (*mountain*). He doesn't like the (media) product when watching it. He describes that he could only be seen running (and not jumping) and that his classmates teased him. He actively advocated deleting the scene. This is where opportunities and challenges become visible. Watching a scene afterwards allows a more intensive discussion and evaluation of one's own movement actions. Sven can look at the scene and decide whether he considers it well executed or not. In the process, he can delete this part and he could now stage the scene again from scratch if necessary. There is also the option to select a different section of the filmed sequence in the iMovie app used. Since the trailer function of iMovie allows only limited possibilities of post-production, however, the children mostly filmed their sequences again.

5.2.2 Improving and developing the product

I: Do you remember what you want to do next week?
Kevin: Improve things to make it look cooler.
I: Ok. What do you have to do there? When improving?
Kevin: The things that you don't want to have in there and where you think it can come out even better, that you improve them a bit.
I: And what do you think, what do you have to do to improve it?
Kevin: To make something cooler, because then it will be a little bit more exciting.

Kevin describes the task for the next hour. Based on the scenes that have already been created, they should continue to work on the media product at several points in time. For him, the movements to be completed in this context should look '*cooler*'. This aims at different aspects. An action already recorded can be viewed and, if necessary, deleted at that point, too. The focus here is on an improved movement action – directly linked to what is seen –, which is then performed and filmed. It is ideally performed in such a way that it fulfills certain previously specified criteria compared to the deleted scene – in this case '*cooler*' and '*more exciting*'. Such an option of comparison and adjustment does generally not exist in this form in the transient environment of a PE classroom. The norm for evaluating the movement at this point is not the objectively measurable time during a run or the correct execution of a standardized gymnastic movement. The children's value judgments are based on creative movement sequences that look '*cool*', that are particularly emphasized by the children's acting performance as '*gangster-like*' or highlighted by means of cinematic design. It is up to Kevin and possibly his classmates, who also see the video of the movement, to assess whether it is sufficient for the media product they want to create, or whether they should delete it and record a new video.

This kind of adjustment is normally not part of physical education. While you can erase a product in other subjects (e.g., the written solution to a task), in PE a lot is directly linked to the actual action. This is partially equalized by filming.

5.2.3 Appreciation and recognition of the product

In the scene described above, the desire for recognition of the 'cool' performance that the students achieve becomes clear. This becomes noticeable again in the next interview passage. Jim reports that the product was viewed together as a class.

Jim: Ms. Schulzen will come and then she turns on the whiteboard and we watch it and then we watch the film. Our film that we made in PE.

I: But that's exciting.
Jim: I am happy to be in it and that everyone applauds (…)

Already in advance, the student reports positive emotions that he associates with the presentation of the media product in the classroom to his classmates. He seems to be proud of the product ('*film*') and is happy about the applause of his classmates and probably also the teacher. The possibility of delimiting the sports hall as a learning location becomes clear here. Activities from the sports hall are carried on in the classroom.

Ella then describes the joy of confirming the recognition. She describes the situation in the classroom when the class watched a media product that a group of students had created.

Ella: And ehm I found it really funny with ehm the very first one, mhm or with ehm yes the one with Clara when she jumped on the bench like that yes and then I found all of them really funny, but during eh Ali's everyone had to laugh really hard […] They couldn't save themselves from laughing.

Ella impressively describes the good atmosphere in the class and the joy of the other students when watching the film. The different movements can be seen in the media product sequenced and edited accordingly, which is rated positively by the class. They laugh together about the media product, which conveys an appreciation for the children, their movements, and their media design.

6. Discussion

Our investigation was based on the approach of critically and constructively discussing the possibilities of using digital media in PE (Casey, Goodyear, and Armour 2017). In addition to the objectives of physical education, media educational aspects should also be taken into account, which was achieved, among other things, with the aim of creating a media product and reflecting on it. The students look at the media usage almost exclusively in connection with their movement experiences. Something new compared to physical education without the use of digital media is the obvious intertwining of movement-related skills and skills necessary for the use of digital media. There is thus a change through the use of digital media in PE (Armour, Casey, and Goodyear 2016). This results in an expanded range of access to exercise and sports for the students as well as in greater opportunities to contribute their own skills to physical education. In addition to competencies and skills regarding the execution of movements and the knowledge about sporting processes, being proficient in handling the tablet and the app used as well as contributing the newly learned film language became relevant. In this way, a contribution to film education could be made, which is part of media education and provides knowledge for a critical, creative and, last but not least, enjoyable handling of moving images. Students could get involved in the process of designing the media product without having to move in front of the camera. The position behind the camera could be filled out, e.g. if the students had ideas and concepts for scenes that could be staged. 'Hiding behind the camera' (Goodyear, Casey, and Kirk 2014) gives all students the opportunity to participate in the lessons in their own way. At this point, media literacy (usually in combination with movement-related skills) has an impact on the processes in physical education. The broadened access spectrum also offered opportunities for conflicts among the students, but this should be seen as an everyday occurrence and opportunity for social learning in physical education (Dyson and Dryden 2014).

In the lesson arrangements we evaluated, the use of digital media emphasized product-oriented lesson contents and goals. This yielded various opportunities for the students to shape their own learning process and, if necessary, to take on new and attractive roles. With the goal of a flexible design of physical education in the sense of a multi-perspective approach in mind, this can be classified as a positive result (Balz and Neumann 2015). The students report about motivated and joyful work with the tablet and also about the change between roles (mainly '*camera child*' and '*actor/actress*'). They described situations in which recordings were rated as successful or

unsuccessful, in which scenes were selected for or deleted from the final product. This self-determined dealing with images of oneself and others by both active implementation during class and addressing the legal foundations, promotes self-determined handling of media and media products as well as the own and external data that is generated when working with digital media. This can also be seen as an important learning goal in PE (Goodyear, Kerner, and Quennerstedt 2019).

The children reported a special phenomenon provided by the film option. The possibility to preserve activities in the sports hall and thus to temporarily overcome the transience of movement opened up many options, some of them new for physical education (Greve et al. 2020; Thumel et al. 2020). The students were able to watch their movements, talk about them, think about them, evaluate them, delete the recordings, develop and change ideas, and correct film sequences focusing on their media product by executing the movements again and having them filmed. The focus is therefore not exclusively on athletic performance, which can be increased by using digital media in PE. It is important, however, that the students had to use movements in order to solve the tasks of the lesson. The goal of using digital media in physical education must not be that schoolchildren can completely avoid movement by only working on tasks using a tablet. As demonstrated in these lessons, the tablet should be seen as a part of lesson staging. According to Prohl (2006), the actual process of experiencing can be increased in quality through the sensible use of digital media. As a result, digital media can make a substantial contribution to children's movement education. At the same time, a responsible handling of media is promoted.

The study results further highlight the fun and enjoyment, which matches the results from Lee and Gao (2020) that the pupils report about viewing their media products. Fun can be seen as the core component of a good physical education classroom (Kearney and Schuck 2006). Since the media products can be preserved, fun and enjoyment can be experienced not only when moving, but also when watching movements of oneself and others. The created product can be watched together by students and teachers. The joint review and the appreciation of such products is crucial for the media education component of lesson staging. It is also evident that when children assess the products this kind of lesson staging brings aesthetic components (Steinberg et al. 2020) to the fore. It emphasizes the aspect of expressing oneself physically and of designing movements (Kurz 2009), which is rarely possible due to the transience of movements and the organizational limits of physical education.

Through the use of various functions and apps, the students can also acquire additional media education skills, for instance, about the changes in the effect of movements on the viewer, e.g. when they are played in slow motion or recorded from a specific camera setting. Thus there are further possibilities for changing or staging movements besides adjusting a movement in the media product by deleting and re-recording. This demonstrates the different target dimensions (media competence and movement competence). However, it also shows the interrelationship and the learning potential of this kind of lesson staging. It is generally important that the underlying rules of conduct for the production and selection of scenes are based on both legal and ethical standards (Goodyear 2017). It is therefore necessary to discuss with the children the process of recording and the agreements that are necessary before publishing personal data. This includes both recording, checking who the data belongs to (copyright and personal rights), and which agreement and consent is required between the children for the final use of the data. In the example described here, this applies exclusively to the use of the material within the class in the context of the sports lesson. However, this topic can also be transferred to larger contexts.

Furthermore, the students described an orientation towards the product to be created, which indicates focused work processes and organization of work. This is important to emphasize, since physical education is justifiably often supposed to provide students with exactly the opposite. Getting absorbed in one's own actions, or (with regard to physical education) in physical activity, games and sports, without another goal than physical activity, games and sports itself, is a fundamental aim of sports (teaching), which is very much justified. The teacher must therefore keep an eye on an appropriate balance when planning lessons, because the use of digital media in physical

education is exposed to criticism in this context. Based on the children's age and the prevalent heterogeneity of athletic and cognitive performance in primary school classes, we chose a rather open format for the lessons. This harmonized well with the usage of tablets and the creatively oriented tasks.

7. Conclusion

The evaluated teaching units followed the goal of linking objectives of media education to those of sports pedagogy (Greve et al. 2020). It becomes clear that the use of digital media in primary school PE classrooms can make sense and offers new possibilities for lesson staging. It is precisely the way of lesson staging that is essential for the success of implementing digital media (Bodsworth and Goodyear 2017). The use of digital media not only opens up new possibilities in the context of learning and experiencing movement (learning with media) but also means that students have to learn something about media and how to deal with generated personal data. Our research has also shown that physical activity is more important to students than the use of media.

Notes

1. The choice of a primary school in Germany primarily depends on where the students live (primary school district). Therefore, primary schools have a comparatively high degree of heterogeneity among the student body compared to secondary schools, in which the students are separated according to their performance.
2. A detailed description of the units can be found at Thumel, et al. 2019.
3. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.
4. The structure of the app iMovie (trailer) led the children to change the size settings.

Acknowledgement

The authors thank Judith Keinath from the Universität Hamburg very much for the translation of the article.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Steffen Greve http://orcid.org/0000-0001-6562-7662

References

Armour, Kathleen M., Ashley Casey, and Victoria A. Goodyear. 2016. "A Pedagogical Cases Approach to Understanding Digital Technologies and Learning in Physical Education." In *Digital Technologies and Learning in Physical Education: Pedagocical Cases*, edited by Ashley Casey, Victoria A. Goodyear, and Kathleen M. Armour, 1–12. London: Routledge. https://www.taylorfrancis.com/books/e/9781315670164/chapters/10.4324/9781315670164-1.

Balz, Eckart, and Peter Neumann. 2015. "Mehrperspektivischer Sportunterricht. [Multi-Perspective Physical Education]." *Sportpädagogik* 39 (3 + 4): 2–7.

Bodsworth, Hannah, and Victoria A. Goodyear. 2017. "Barriers and Facilitators to Using Digital Technologies in the Cooperative Learning Model in Physical Education." *Physical Education & Sport Pedagogy* 22 (6): 563–579. doi:10.1080/17408989.2017.1294672.

Bos, Wilfried, Birgit Eickelmann, Julia Gerick, Frank Goldhammer, Heike Schaumburg, Knut Schwippert, Martin Senkbeil, Renate Schulz-Zander, and Heike Wendt. 2014. *ICILS 2013 – Computer- und Informationsbezogene Kompetenzen von Schülerinnen und Schülern in der 8. Jahrgangsstufe im Internationalen Vergleich [Computer and Information-Related Competences of Pupils in Year 8 in International Comparison]*. Münster: Waxmann.

Casey, Ashley, Victoria A. Goodyear, and Kathleen M. Armour. 2016. *Digital Technologies and Learning in Physical Education: Pedagocical Cases*. London: Routledge.
Casey, Ashley, Victoria A. Goodyear, and Kathleen M. Armour. 2017. "Rethinking the Relationship Between Pedagogy, Technology and Learning in Health and Physical Education." *Sport, Education and Society* 22 (2): 288–304. doi:10.1080/13573322.2016.1226792.
Casey, Ashley, and Peter A. Hastie. 2011. "Students and Teacher Responses to a Unit of Student-Designed Games." *Physical Education & Sport Pedagogy* 16 (3): 295–312. doi:10.1080/17408989.2010.535253.
Corbin, Juliet M., and Anselm L. Strauss. 1996. *Grounded Theory: Grundlagen Qualitativer Sozialforschung [Grounded Theory: Fundamentals of Qualitative Social Research]. 1st ed*. Weinheim: Beltz, Psychologie Verl.-Union.
Couldry, Nick, and Andreas Hepp. 2013. "Conceptualizing Mediatization: Contexts, Traditions, Arguments." *Communication Theory* 23 (3): 191–202. doi:10.1111/comt.12019.
Dowrick, Peter W. 2012. "Self Modeling: Expanding the Theories of Learning." *Psychology in the Schools* 49 (1): 30–41. doi:10.1002/pits.20613.
Dyson, Ben, and Craig Dryden. 2014. "Cooperative Learning: Social Skill Development in Physical Education." *ACHPER Active and Healthy Magazine* 21 (2/3): 6–11.
Eickelmann, Birgit. 2014. *Grundschule in der Digitalen Gesellschaft: Befunde aus den Schulleistungsstudien IGLU und TIMSS 2011 [Primary School in the Digital Society: Findings from the School Achievement Studies IGLU and TIMSS 2011], 1st ed*. Münster: Waxmann. http://www.content-select.com/index.php?id=bib_view&ean=9783830980209.
Eickelmann, Birgit, Julia Gerick, and Wilfried Bos. 2014. "Die Studie ICILS 2013 im Überblick. [The ICILS 2013 Study at a Glance]." In *ICILS 2013 - Computer- und Informationsbezogene Kompetenzen von Schülerinnen und Schülern in der 8. Jahrgangsstufe im Internationalen Vergleich [Computer and Information-Related Competences of Pupils in Year 8 in International Comparison]*, edited by Wilfried Bos, Birgit Eickelmann, Julia Gerick, Frank Goldhammer, Heike Schaumburg, Knut Schwippert, Martin Senkbeil, Renate Schulz-Zander, and Heike Wendt, 9–31. Münster: Waxmann.
Ferrari, Anusca. 2013. *DigComp: A Framework for Developing and Understanding Digital Competence in Europe*. Sevilla: JRC-IPTS.
Gard, Michael. 2014. "eHPE: a History of the Future." *Sport, Education and Society* 19 (6): 827–845. doi:10.1080/13573322.2014.938036.
Goodyear, Victoria A. 2017. "Social Media, Apps and Wearable Technologies: Navigating Ethical Dilemmas and Procedures." *Qualitative Research in Sport, Exercise and Health* 9 (3): 285–302. doi:10.1080/2159676X.2017.1303790.
Goodyear, Victoria A., Ashley Casey, and David Kirk. 2014. "Hiding Behind the Camera: Social Learning Within the Cooperative Learning Model to Engage Girls in Physical Education." *Sport, Education and Society* 19 (6): 712–734. doi:10.1080/13573322.2012.707124.
Goodyear, Victoria A., Charlotte Kerner, and Mikael Quennerstedt. 2019. "Young People's Uses of Wearable Healthy Lifestyle Technologies; Surveillance, Self-Surveillance and Resistance." *Sport, Education and Society* 24 (3): 212–225. doi:10.1080/13573322.2017.1375907.
Greve, Steffen, Mareike Thumel, Florian Jastrow, Claus Krieger, and Jessica Süßenbach. 2020. "Digitale Medien im Sportunterricht der Grundschule: Ein Update für die Sportdidaktik?! [Digital Media in Primary School Physical Education: An Update for Sports Didactics?!]." In *Digitale Bildung im Grundschulalter: Grundsatzfragen zum Primat des Pädagogischen [Digital Literacy at Primary School age: Fundamental Questions on the Primacy of the Pedagogical]*, edited by Mareike Thumel, Rudolf Kammerl, and Thomas Irion, 325–340. München: kopaed.
Gröben, Bernd, and Robert Prohl. 2012. "Good Practice Methods in Physical Education – Cooperative Learning." *Journal of Physical Education & Health - Social Perspektie* 1 (1): 43–52.
Hamlin, Barb. 2005. "Motor Competency and Video Analysis." *Teaching Elementary Physical Education* 16 (5): 8–13. https://eric.ed.gov/?id=EJ734011.
Hebbel-Seeger, Andreas, Claus Krieger, and Frank Vohle. 2014. "Digitale Medien im Sportunterricht. Möglichkeiten und Grenzen Eines Pädagogisch Wünschenswerten Medieneinsatzes. [Digital Media in Physical Education. Possibilities and Limits of a Pedagogically Desirable use of Media]." *Sportpädagogik* 38 (5): 2–5.
Kearney, Matthew, and Sandy Schuck. 2006. "Spotlight on Authentic Learning: Student Developed Digital Video Projects." *AJET* 22: 2. doi:10.14742/ajet.1298.
Koekoek, Jeroen, and Ivo van Hilvoorde. 2018. *Digital Technology in Physical Education: Global Perspectives. Routledge Studies in Physical Education and Youth Sport Ser*. Milton: Routledge. https://ebookcentral.proquest.com/lib/gbv/detail.action?docID=5394268.
Krieger, Claus. 2016. "Pragmatische Verwendung der Kodierverfahren der Grounded Theory … und Darüber Hinaus?" [Pragmatic use of Grounded Theory Coding Methods … and Beyond?]." In *Bildungsforschung Revisited, 1st ed. Weingartner Dialog für Forschung 1*, edited by Gregor Lang-Wojtasik, and Stefan König, 43–59. Ulm: Klemm + Oelschläger.
Kultusministerkonferenz. 2012. "Medienbildung in der Schule." [Media education at school]. Accessed June 19, 2020. https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2012/2012_03_08_Medienbildung.pdf

Kultusministerkonferenz. 2017. “Bildung in der digitalen Welt.” [Education in the digital world]. Accessed July 02, 2019. https://www.kmk.org/fileadmin/Dateien/pdf/PresseUndAktuelles/2016/Bildung_digitale.

Kurz, Dietrich. 2009. “Der Auftrag des Schulsports. [The Task of School Sport].” In *Schulen in Bewegung - Schulsport in Bewegung: Jahrestagung der dvs-Sektion Sportpädagogik vom 22. - 24. Mai 2008 in Köln, Schriften der Deutschen Vereinigung für Sportwissenschaft 190*, edited by Hans P. Brandl-Bredenbeck, 36–51. Hamburg: Czwalina.

Lee, Jung E., and Zan Gao. 2020. “Effects of the IPad and Mobile Application-Integrated Physical Education on Children’s Physical Activity and Psychosocial Beliefs.” *Physical Education & Sport Pedagogy* 25 (6): 567–584. doi:10.1080/17408989.2020.1761953.

Luguetti, Carla, Victoria A. Goodyear, and Mauro H. André. 2019. “‘That is Like a 24 h-day Tournament!’: Using Social Media to Further an Authentic Sport Experience Within Sport Education.” *Sport, Education and Society* 24 (1): 78–91. doi:10.1080/13573322.2017.1292235.

Lupton, Deborah. 2015. “Data Assemblages, Sentient Schools and Digitised Health and Physical Education (Response to Gard).” *Sport, Education and Society* 20 (1): 122–132. doi:10.1080/13573322.2014.962496.

Marttinen, Risto, Dillon Landi, Ray N. Fredrick, and Stephen Silverman. 2020. “Wearable Digital Technology in PE: Advantages, Barriers, and Teachers’ Ideologies.” *Journal of Teaching in Physical Education* 39 (2): 227–235. doi:10.1123/jtpe.2018-0240.

McKenzie, Thomas L., and Monica A. F. Lounsbery. 2013. “Physical Education Teacher Effectiveness in a Public Health Context.” *Research Quarterly for Exercise and Sport* 84 (4): 419–430. doi:10.1080/02701367.2013.844025.

Mey, Günter, and Katja Mruck. 2009. “Methodologie und Methodik der Grounded Theory. [Methodology and Methodology of Grounded Theory].” In *Forschungsmethoden der Psychologie: Zwischen Naturwissenschaftlichem Experiment und Sozialwissenschaftlicher Hermaneutik [Research Methods in Psychology: Between Scientific Experiment and Social Science Hermaneutics], 3rd ed., Hochschullehrbücher 2*, edited by Wilhelm Kempf, 100–152. Berlin: Regener.

Neumann, Peter, and Eckart Balz. 2020. *Grundschulsport. Empirische Einblicke und Pädagogische Empfehlungen [Elementary School Sports. Empirical Insights and Pedagogical Recommendations]*. Aachen: Meyer & Meyer.

O’Loughlin, Joe, Deirdre N. Chróinín, and David O’Grady. 2013. “Digital Video: The Impact on Children’s Learning Experiences in Primary Physical Education.” *European Physical Education Review* 19 (2): 165–182. doi:10.1177/1356336X13486050.

Prohl, Robert. 2006. *Grundriss der Sportpädagogik [Ground Plan of the Sports Pedagogy], 2nd ed*. Wiebelsheim: Limpert.

Ruin, Sebastian, and Günter Stibbe. 2016. “Erziehender Sportunterricht und Kompetenzorientierte Lehrpläne. [Educational Physical Education and Competence-Oriented Curricula].” In *Didaktik des Schulsports: Beiträge zu Einer Zeitgemäßen Diskussion [Didactics of School Sport: Contributions to a Contemporary Discussion], Nachdruck von Einzelnen, Teilweise überarbeiteten Beiträgen zur Didaktik des Schulsports aus der Zeitschrift Sportunterricht aus den Jahren 1983 bis 2016, Sportunterricht Sonderheft*, edited by Günter Stibbe, and Martin Holzweg, 147–153. Schorndorf: Hofmann.

Schierz, Matthias, and Jörg Thiele. 2013. “Weiter Denken – Umdenken – neu Denken? Argumente zur Fortentwicklung der Sportdidaktischen Leitidee der Handlungsfähigkeit. [Think Further - Rethink - re-Think? Arguments for the Further Development of the Didactic Guiding Idea of the Capacity to act].” In *Didaktische Konzepte für den Schulsport [Didactic Concepts for School Sports], Edition Schulsport 21*, edited by Heinz Aschebrock, 122–147. Aachen: Meyer & Meyer.

Schorb, Bernd, and Ulrike Wagner. 2013. “Medienkompetenz – Befähigung zur Souveränen Lebensführung in Einer Mediatisierten Gesellschaft. [Media Competence – Empowerment for a Sovereign Lifestyle in a Mediatized Society].” In *Medienkompetenzförderung für Kinder und Jugendliche. Eine Bestandsaufnahme [Promotion of Media Competence for Children and Young People. A Stocktaking]*, edited by Bundesministerium für Familie, Senioren, Frauen und Jugend, 18–23. Berlin: Bundesministerium für Familie, Senioren, Frauen und Jugend.

Steinberg, Claudia, Maren Zühlke, Tim Bindel, and Florian Jenett. 2020. “Aesthetic Education Revised: a Contribution to Mobile Learning in Physical Education.” *German Journal of Exercise and Sport Research* 50 (1): 92–101. doi:10.1007/s12662-019-00627-9.

Stibbe, Günter. 2011. ““Standards, Kompetenzen und Lehrpläne im Fach Sport – Einführung.” [Standards, Competencies and Curricula in Sport - Introduction].” In *Standards, Kompetenzen und Lehrpläne: Beiträge zur Qualitätsentwicklung im Sportunterricht [Standards, Competences and Curricula: Contributions to Quality Development in Physical Education], Reihe Sport 16*, edited by günter stibbe, and heinz aschebrock, 11–15. schorndorf: Hofmann.

Thumel, Mareike, Florian Jastrow, Steffen Greve, Claus Krieger, and Jessica Süßenbach. 2019. “... und action! Bewegungsfördernder Einsatz von Tablets. ... and action! Physical activity-promoting use of tablets].” *Grundschule Sport* 6 (3): 6–9.

Thumel, Mareike, Anja Schwedler-Diesener, Steffen Greve, Jessica Süßenbach, Florian Jastrow, and Claus Krieger. 2020. “Inszenierungsmöglichkeiten Eines Mediengestützten Sportunterrichts. [Ways of Staging a Media-Supported Physical Education Classroom].” *MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung* 17 (Jahrbuch Medienpädagogik): 401–426. doi:10.21240/mpaed/jb17/2020.05.16.X.

Tulodziecki, Gerhard, and Silke Grafe. 2013. "Digitale Medien und Schule aus Medienpädagogischer Sicht. [Digital Media and School from a Media-Pedagogical Perspective]." In *Digitale Medien und Schule: Zur Rolle Digitaler Medien in Schulpädagogik und Lehrerbildung [Digital Media and School: On the Role of Digital Media in School Pedagogy and Teacher Education]*, edited by Dietrich Karpa, Birgit Eickelmann, and Silke Grafe, 11–35. Reihe 19. Immenhausen bei Kassel: Prolog-Verlag. konzeptionelle Entwicklungen und empirische Forschung.

Tulodziecki, Gerhard, Bardo Herzig, and Silke Grafe. 2019. *Medienbildung in Schule und Unterricht [Media Education in Schools and Education]*. Klinkhardt: UTB.

van Rossum, Tom, and David Morley. 2018. "The Role of Digital Technology in the Assessment of Childreńs Movement Competence During Primary School Physical Education Lessons." In *Digital Technology in Physical Education: Global Perspectives, Routledge Studies in Physical Education and Youth Sport Ser.*, edited by Jeroen Koekoek, and Ivo van Hilvoorde, 48–68. Milton: Routledge.