

EXPLORING STUDENTS' MULTIMODAL MOBILE USE AS SUPPORT FOR SCHOOL ASSIGNMENTS

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Abstract

This paper engages with how students use multimodality on mobile devices as support for school assignments. The broader aim of this pilot study is to explore understanding of teachers' and students' expressed experiences of students' multimodal mobile use. Focus group interviews and multimodal analysis have allowed investigation of the following research questions:

- What experiences do teachers and students express from students' multimodal mobile use related to school assignments?
- Which advantages and disadvantages have teachers and students expressed concerning students' multimodal mobile use as support for school assignments?

The results show that students and teachers have many different experiences of students' multimodal mobile use related to school assignments. However, the use is limited in several ways. To a large extent teachers and students have expressed that multimodal mobile resources can be used advantageously by students to support school assignments for several purposes. Among disadvantages identified mobile device multimodality in some respects can be disruptive. The result also indicates that different multimodal mobile media have specific possibilities for supporting students' learning as it is related to school assignments.

Introduction

It has become common for people to use their mobile devices for the exchange of experiences in informal settings.[1] Mobile devices provide

opportunities to communicate regardless of location, as well as the possibility of multimodal representations. Multimodality implies that different modalities, such as sound, image and text, are viewed as a whole, and make meaning with multiple articulations. [2] Many people utilize these capacities and use videos, photos and texts to share their experiences with other people. [3,4] Previous research indicates that these opportunities provided by mobile devices for learning and communication are rarely utilized effectively in formal education, especially in K-12 levels.[5] Mobile learning can change the nature of learning in formal contexts, since it can be delivered "just in time" and "just for me". [6] Although it has been argued that mobile devices and multimodal representations have great potential to support formal learning, the research field of multimodal use in mobile learning is quite unexplored. [7,8]

This ongoing research project highlights students' and technology teachers' experiences of mobile devices and multimodality in their school contexts. The pilot study is anchored at a Swedish elementary school. A plurality of the national curricula emphasizes the students' abilities to document their work with different forms of expression, and with digital resources.[9]

The aim of this pilot study is to explore understandings of students' and teachers' experiences of mobile learning and multimodality in their school contexts. The focus is on students' learning. Mobile learning, in our perspective, is when students use interactive mobile devices in their learning, as it relates to school assignments. To increase our knowledge about students' and teachers' experiences, especially their descriptions of

previously experienced activities of how mobile devices and multimodality have, or have not been used in connection with school assignments, the following research questions are put forward:

- *What experiences do teachers and students express from students' multimodal mobile use related to school assignments?*
- *Which advantages and disadvantages have teachers and students expressed concerning students' multimodal mobile use as support for school assignments?*

Theoretical Background: Multimodality

This study uses a multimodal perspective, which considers different modalities as a whole that creates meaning with multiple articulations.[10] For example, a photo of a picture that also includes text is not seen as mono-modal, as either an image or a text. The image and the text are considered as a whole, created by two modalities that together create meaning.

A mobile device provides access to several different media. It is possible to record sound, photos, and video, and to send messages, look at pictures, watch movies, read messages, listen to podcasts, and so on. Different media in turn offer multimodal opportunities for communication. For example, a podcast on a mobile device is a medium because it has multimodal affordance for us to listen to different sounds, like verbal speech and music. Affordance is both considered as a materiality of the medium, and as a cultural matter. Different media have experiential meaning potential. Experiential meaning potential derives from what we are able to do, when we articulate or use a medium. A medium for meaning making can be selected, both as an articulation and as an interpretation.

In this study, we use the multimodal perspective to focus on how a medium has been selected, who has been involved, and in what

context has it been selected. We also focus on how multimodality has been produced and distributed. Production refers to articulations that are made, while the distribution highlights where transmitting and recording have been done. Media in mobile devices offer the ability to be both transmitted and recorded. Transmitting is, for example, listening to podcasts, while photographing is the same as recording. The aspect of distribution in multimodal analysis indicates if the multimodal information has been recorded and/or transmitted.

Previous Research

Many studies have examined how young people use mobile devices for multimodal communication in their leisure time or during visits to museums and science centers. However, research on multimodality and mobile learning in school contexts is relatively unexplored. In our review, we focus on research about mobile learning and multimodality in the school context. We are particularly interested in research highlighting the advantages and disadvantages of mobile learning and multimodality.

Pachler et al. (2010) suggest that schools should be able to adopt students' everyday mobile use into school settings. They describe how young people use their mobile devices to, for example, listen to music, take pictures, and share videos, and they argue that mobile learning and multimodality have the potential to be used in schools. Most teachers are described as being skeptical of the idea that mobile devices could be a resource for learning in school. The authors claim that schools are anxious to retain control in learning settings that include mobile devices. They also highlight that one disadvantage in relation to formal learning is a risk of distraction. Many schools have banned and restricted the use of mobile devices in schools because there is a fear of e-security violations and of unethical behavior. [11]

Similarly, Thomas, Bannon and Britt (2014) have recently found that many schools have mobile device bans because teachers perceive that mobile devices may interfere with teaching. In a quantitative study, they investigated the relationship between teachers' ages and attitudes towards using mobile devices and multimodality in school. They found that the function that teachers felt are most useful in school-related work is internet access, closely followed by the calculator and calendar functions. Using mobile media for video recording, photography, and listening to music are ranked less beneficial compared to internet access, calculator, and calendar functions. [12]

Related research in language learning shows that mobile learning and multimodality might be useful for formal learning. Looi et al. (2009) investigate how mobile technology and multimodality could support English lessons. In a study of a learning situation, the pupils were encouraged to make their own choices of how to complete an assignment. Findings indicate that the possibility to choose different modalities on mobile devices and different environments outside the classroom is beneficial to students' learning. It is also suggested that the opportunity to solve tasks in different ways, depending on learning style, is helpful to the students. Findings show that mobile learning opens more teacher-directed communication in classrooms and more student-led communication outside classrooms. In fact, Looi et al. (2009) do not reveal or discuss any disadvantages in the use of mobile devices and multimodality. [13]

Method

Research Setting and Data Collection

The respondents of this study are two female technology teachers at an elementary school and seven students in a ninth-grade class. Both teachers teach technology and science, but are formally educated in science. A class of thirteen students was asked to participate. Students' legal guardians were informed, and they gave written consent for the students to participate.

All students whose legal guardians gave written consent participated. Teachers' consents to participate were obtained orally.

Focus Group Interviews

The focus group interview method was selected to let students and teachers express and discuss their experiences of multimodal mobile use. Respondents were interviewed in groups. Students and teachers were interviewed separately, to increase student interaction during discussions. [14] Students were divided and interviewed in two different groups, with three and four students per group. The student group A consisted of two boys and two girls, and group B of three girls. Open-ended questions were used, with the purpose of gaining insight into the respondents' previous experiences of and attitudes to mobile learning and multimodality. [15,16,17,18] The questions were based on themes about students' experiences of using mobile devices and different modalities in school contexts. An overarching theme was: do students use mobile devices in school? If so which modalities have they used, such as text, video, photo and/or sound? The focus groups also included *the nominal group technique*. [19] This means that students and teachers wrote their thoughts on post-it notes, upon which those thoughts were discussed in the focus group. All interviews were conducted at the respondents' school by the first authors, were recorded with audio recorders and were transcribed.

Data Analysis

The data was analyzed by means of theories adopted from multimodal discourse analysis (see Figure 1). [20] An initial categorization of students' media experiences in relation to school assignments was made. The analysis highlighted which media students have expressed experiences of their mobile devices. Students' media choices were thereafter analyzed. The analysis focused on why specific media were selected. Who was expressed as involved, and in what context were they involved? The analysis

has also highlighted whether the applied multimodality is articulated, recorded, and/or transmitted.

Experiential meaning potentials in different media were also analyzed. Students' and teachers' articulated skepticism, hesitations or repudiation were analyzed as disadvantages. Descriptions without skepticism, hesitations or repudiation were interpreted as advantages. The analysis of advantages have emphasized how students and teachers experience the fact that different media have affordances to support students meaning making related to school assignments. All respondents were anonymized in transcripts. All quotes have been translated from Swedish to English.

Results

The results are structured in two parts. The first part describes student experiences of media use for; photo, video, sound, translation, information retrieval, calculating, notes and messages. The next part contains the expressed advantages and disadvantages with students' use of mobile multimodality as support for school assignments.

Students' Multimodal Mobile Use

Media Used for Photos

Both students and teachers expressed that students used the camera function on their mobile devices to take photographs at school. The medium is used by students to transfer information between different environments. Students in focus group A explained that they have taken photos of written notes about homework in the classroom. The teachers give a similar description, noting that students photograph homework instructions during mentoring lessons, to have access to the information. They mention that the reason for the media choice is that taking notes in a calendar does not work well for many students: "Yes, we had it as an element in our mentor time. Just like 'all your homework is written there. Take a photo, so you have it.' Because many [students] struggle when it comes to writing in their calendar." The quote describes how photographs are articulated and recorded by the students at the request of the teacher, in order to transmit the information to other contexts.

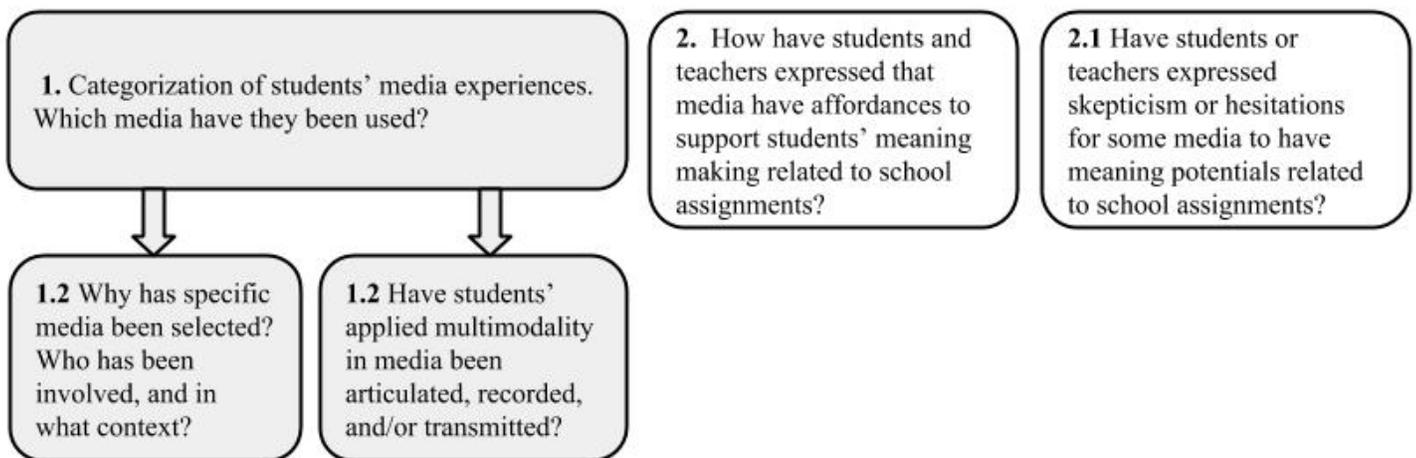


Figure 1. Data analysis

Likewise, teachers also mention that students are used to photographing paper documents at school to transmit information home from school: “They document and take pictures, in order to bring it home. For example, when we distribute paper documents, they are taking pictures of them. In case they lose the paper, they still have it.” The teachers reported that students also can ask if they may take pictures of their drawings.

Two of the students in focus group B explained that they have photographed sketches they had made in the technology subject, during a study visit (see Figure 2). They have chosen the photo medium in order to remember what they have done: “We wanted to remember what we had done.” By recording photographs of drawings with their mobile devices, they have also experienced opportunities to transmit the images at any time. In interviews, subjects expressed that the mobile device is always available. The students in the group also had experience of taking pictures of objects that they had done in crafts education. The mobile camera was used to take selfies along with their objects. The recorded photographs of their creations were usually transmitted by the students themselves. When they were asked if the photos were taken to be shared the students replied that they mostly transmitted the images on their own.

However, in focus group A all students had experiences of recording and transmitting mobile photos from outdoor contexts to teachers in school. The experiences were addressed to lessons in science and physical education, when students were asked to take photos outdoors with mobile phones. In physical education, mobile cameras were used, to take photos of controls in orienteering: “Then we had to run out and take photos on places where the control points were.” In science, the media were used to document the nutrient level of the lake: “We were to take photos of the water, showing how the water was in the lake.” The choice of media has in both cases been part of the task. In their

description of the task in science, the students distributed their photos later to their teacher at school.

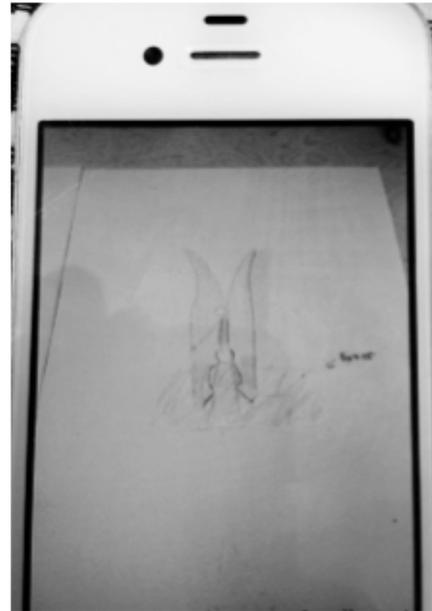


Figure 2. A photographed sketch during a study visit in technology subject.

Media Used for Video

Two students in focus group A said that they had experiences of video work in physical education. One of the students noted that they had video recorded once when they danced. They made the media choice even if they were not required: “But we did not need to video record.” The second student further discloses that they video recorded to see if their dance moves looked good: “Then we recorded, and checked that it looked good.” The students had chosen the video media to record body movements, which they later transmitted to see and assess qualities.

Media Used for Sound

In contrast to the video use, both teachers and students in group B expressed experiences of students sound transmitting by mobile phone to seal themselves off and work undisturbed: “We

are used to having music on our math lessons. [...] We can have headphones if we don't want to listen to others around. We can have music in our ears when we work by ourselves." Students have been able to choose the media if they prefer to listen to music, when they work by themselves in mathematics education. Students in the other focus group had a different experience of mathematics and sound transmitting. The timer function in mobile devices were chosen and used for an auditory alarm during time-limited assignments.

Students in focus group B mentioned that the only time when they had recorded sound was in a task related to language teaching: "Nah, the only time when we have recorded, has been whether we are in English or in some language where we have had some verbal task. Then we can record the file at home and send it to our teacher. But otherwise, we usually do not." The media choice has been expressed as a part of the task. The sound has been recorded by students in their home context and then distributed and transmitted to the teacher's context.

Media for Translation and Information Retrieval

In language teaching, students in group B have used media to translate words in the text. The words have been articulated in one language and transmitted and thereafter interpreted in another. The media choice is determined by the context, such as when students may be allowed by teachers to use the resources for translating text in English education: "They say, 'You may translate the text now.' If so we usually may use it for certain words." Similarly, students also have been able to articulate, transmit, and interpret media on the internet for information retrieval.

One teacher expressed that students sometimes can be allowed to use their mobile devices when they, for example, have been seeking information for factual texts in science. Then, they do not need to go away to a computer: "If we are writing, and for example are about to check something about the body,

then they may use it, instead of going away to arrange a computer." Both student groups have expressed that they used media on the internet for information retrieval.

Similarly, one student in group A expressed that they might be allowed to use mobile devices for information retrieval: "When we are allowed to use it, it could be, when we seek some facts, or something similar. We do not have one computer each. There are many classes that need to use those computers. In order to give everyone some computer access, we sometimes use the mobile to search for facts." The expressed reason to choose media on mobile devices has been instead of using computers that might not be available. The student expresses that media on mobile devices for information retrieval comes in many different subjects, such as Swedish, social studies, and history. With the media on mobile devices, the information was transmitted between online contexts and students in classrooms.

Media for Calculation, Notes, and Messages

Another form of articulation, transmitting and interpretation has also been used in mathematics, by using media for calculating. One student in group A explained that it is chosen occasionally instead of retrieving a classroom calculator: "It's only when you are lazy and do not have energy to go get a calculator."

Media for notes and calendar have also been used to make articulations, and transmit information with mobile devices. Another student in group A noted that the calendar has been chosen and used at some points to write down information about homework and tests: "Well, sometimes we have done it for homework and that kind [...] in the calendar". In a similar way students in group B have experiences of using these media in school-related assignments. The media were chosen to make notes for tests: "If you have tests and such, one can add it to the calendar, or you can

write it down in the notes.” Another reason to select media for note making on mobile devices is that the notes can be transmitted to other students using media for messages: “In cases when someone is writing, one will be able to send it to another. Then there is no need for everyone to write.” Students in group B reported that they also had experiences of someone who probably had articulated and transmitted text messages to other persons on a lesson: “Yes, that mobile was confiscated in the seventh grade. We have not used it since then.” “He probably wrote to people.”

Teachers also had experiences of students who had used the media for text messages. They explained that students have been able to get messages transmitted from other persons through the media, although students are encouraged to not transmit text messages themselves: “The disadvantage is that even if you say that they are not allowed to send a message, there’s always someone else sending text messages to them. So they keep getting these inputs all the time.” Even if the students have been encouraged to not use the media, other persons are able to choose and use the media to send messages to students, which they can then interpret.

Expressed Advantages and Disadvantages

Expressed Advantages

Teachers and students have expressed several experiential advantages of multimodal mobile learning. In different ways, mobile devices and multimodality have affordance to support students’ meaning making in relation to school assignments. The support that has been provided includes opportunities for pupils to communicate their experiences outside school to teachers in other environments. Photo media has expressed to have affordance to students’ to photograph places and phenomena outside school and to distribute their experiences to teachers in the school. Similarly, media for sound have affordances to students to record and transmit their experiences in language

learning. The media on mobile devices also gave students opportunities to be mobile in their language learning, as they have been able to do school work at home, and then could share their experiences with their teacher.

In classroom environments, students have been able to listen to music, use the sound of the timer function, and count with the calculator. Several media have affordance to support students learning in mathematics education, just in time, just in place. When students need support, resources are readily available for them. Students expressed similar experiences in relation to other subjects. Multimodal media on the mobile device were readily available to students when they needed to translate texts in language education, and when they needed to retrieve information in other subjects. Mobile devices make multimodal information available to students when other digital resources such as computers are unavailable or far away.

Media on mobile devices have affordances to students to reach information in different contexts, which also is an important reason for students to take photographs of their work. With the help of the photo media on mobile devices, students can remember school assignments that they have completed in other places and time contexts. Mobile devices availability to take pictures in different time and environmental contexts are also expressed as an important affordance compared to paper images. The teachers’ experiences are that photographs on mobile devices offer even safer access to information than physical papers do, when students move between different environments.

Video as a medium has provided possibilities for some students to review and consider their experiences in physical education. The affordance to record and transmit movements was an important reason for the media choice. Another advantage that both teachers and students have expressed is that students using mobile devices have the ability to make notes and take essential information for homework and tests, to other contexts. Some students also

explained that media for messages on mobile devices affords opportunities to streamline note writing since it allows students to communicate with each other.

Expressed Disadvantages

Students' abilities to get in touch with other people by using the media for text messages, are also expressed as a disadvantage, by teachers. The teachers stated that media for messages have affordances which may restrict students' potentials to create meaning. Students have also experienced that their use of message media may be disruptive.

Another experiential disadvantage articulated is how different media could be used in relation to school assignments. Students have doubts that video as a media could be useful in all school settings. A student in group B questioned why video would be produced in school settings. An opportunity that the student mentioned as a possible meaning potential was in physical education where physical techniques could be recorded on video and later transmitted in purpose to remember: "Why should one shoot a video? That's a good question. It might be in physical education, if you should do something that you need to remember. In such cases you might video record it." Even if the student expressed skepticism about the video medium's meaning making potential in relation to all school assignments, she also identified experiential meaning potentials for video to support memory of body movements in physical education.

When students were asked if they have used a mobile device to video record in school contexts, one student in focus group A explains that if he had used that media, he was not using it for school-related work: "Video recorded? Nah, if so it was something else that didn't have anything to do with school work." The student expressed that he has no experience of using video recording media in relation to his school work.

Discussion

Students' Multimodal Mobile Use

Students have used media for multimodal articulation, recording, and transmitting in relation to school assignments. Regarding students' experiences of choosing media to support school work, the choice has been controlled by both students and teachers. Teachers' instructions may impact students' abilities to choose and use multimodality on mobile devices in different ways. The results reveal a discourse where the teacher has primary control over how and when media for multimodality are used. The teacher invites students to use mobile devices at specific times. Students who want to use the device in other situations and for other purposes must ask the teacher for permission or risk breaking rules.

The results show that students' media choices outdoors have been largely teacher-led. This result contrasts a previous study, which found that mobile learning is more student-led outside than inside classrooms. [21] In that study, students were able to make their own choices of how to solve assignments with different modalities. We suggest that outside and inside environments do not predict whether mobile learning is teacher- or student-led. We have found that task design, and teachers' instructions, also are important factors for students to make personal choices.

In our study, students have used different media for note-taking. Some students articulated and recorded their homework in media for notes, while other students have used media for photos. Teachers have also expressed that they decreed students to use the photo-media, for their note-taking. For note-taking students have chosen media, perhaps even despite teachers' instructions. We suggest that distribution purposes for multimodal mobile uses also affect whether mobile learning is student-led or teacher-led. Multimodal mobile use distributed and interpreted by students themselves, has considerable ability to be student-led. Students

uses made to be distributed and interpreted by teachers are highly affected by teachers' instructions and task design.

Unlike in many other studies, students and teachers in this present study did not express any general rules for mobile bans in their school. [22,23] However, they have articulated rules in practice that limits their use. As Pachler et. al. (2010), found schools are keen to retain control. Pachler et. al. (2010) point out that one disadvantage in relation to formal learning is a risk of distraction. The results in this study indicate that the risk for distraction is one reason for the limited and teacher-led mobile use in schools. Teachers have articulated that students have been distracted by text messages distributed by others outside the classroom. Students have also stated that their mobile devices might be taken away if they send messages to others. In contrast to Pachler et. al. (2010) neither students nor teachers in this study said that mobile use is limited due to fears of e-security violations or of unethical behavior. [24]

Expressed Advantages and Disadvantages

Students and teachers claimed that mobile devices and media for multimodality have affordance to support school work in many ways. Mobile photos are claimed more reliable than paper. Photos have advantages for supporting students' memories among different contexts. Writing homework notes and transmitting them between students is efficient with mobile media for messages. Media on mobile devices offers access to information, in lack of computers or if other resources have been a bit away.

The idea that teachers are skeptical of mobile learning and the attitude that mobile devices can disrupt teaching are actually more nuanced than previous research has described. [25,26] This study argues that teachers and students are not skeptical toward all mobile learning. They have, on the contrary, expressed that multimodal mobile resources can support learning in many different ways. Our research shows that various

media for multimodality have been identified as being useful in different ways and contexts. Sound was used in language education to communicate experiences in language pronunciations. Video offers the ability to see, evaluate and remember movements in physical education. Translation media were also used in language education. Media have been used to search for information on the internet, in many different subjects. Our findings are similar to those of Thomas, Bannon and Britts' (2014), who stated that internet access is a highly ranked function for teachers. [27] Our study differs, however, in teachers' attitudes toward using photo media and toward using media for calculation. Students and teachers claim that photo media supports students in many different subjects, unlike media for calculation. Our result reveals a pattern where various media have different opportunities to support learning for different purposes in relation to school assignments. For example media for messages has been expressed as both supporting and disrupting, student learning. It is possible to consider whether formal frameworks and purposes, not teachers' ages, cause attitudes about how different multimodal media could be used. [28] Although various media support specific purposes, according to this study the pattern also shows a limited use. Different multimodal media on mobile devices are not used in all respects.

The results in this study indicate that, similar to previous research on informal mobile learning, students share experiences advantageously with images, texts, and video. [29,30,31] We have also found that there are important differences in the way mobile devices and multimodality might support formal learning. In relation to school assignments, students have expressed that they are skeptical in terms of how video media could support their formal meaning making, even though they have experienced video recording in other informal contexts. Relative to this finding, we argue that it may not be possible to bring students' everyday mobile device use of video recording into a formal context, regardless of the manner.

Pachler et. al. (2010) has argued for the advantages of adopting students' everyday mobile device use into school structures. [32] Our research shows that students may make experiential distinctions between different potentials for media to support meaning making in formal and informal contexts.

Students have experienced that mobile devices and multimodality have offered support for them "just in time", "just in place". Does the controlled mobile use also affect the extent to which mobile learning can be "just in time", and "right for me", in formal settings? [33] In this study students' and teachers' skepticism of resource use is unusual, compared to descriptions without. The results show several limitations in how mobile technology and multimodality are used in relation to school assignments. Could the limited use in school settings also have advantages that minimize the identified disadvantages of mobile learning?

This pilot study does not provide any nuanced answer to which advantages and/or disadvantages the limited and teacher-controlled access to multimodality on mobile devices has for students' learning, nor does it show how various constraints may affect learning. This research does show that K-12 students use mobile devices, and the use of these devices might be effective, unlike Kukulska-Hulmes' (2013) previous research. [34]

Conclusion and Future Research

Mobile learning and multimodality can no longer just be described as potential approaches to formal education. This study finds that mobile multimodal resources are already being used for learning in school settings by both students and teachers. However, the use is limited and the knowledge about how the limited use impact learning in practice are relatively unknown. Perhaps there are also differences regarding if and how schools and teachers use mobile devices and multimodality.

Likewise, the present knowledge of how mobile devices and multimodality can be used for different purposes in formal learning is limited. Students' lack of video recording experiences in school work, and their skepticism regarding the use of video recording in some school settings, need further explanations. It is, therefore, an important field to define and examine in further studies.

This study suggests that different media have potentials to support multimodal mobile learning in various formal purposes. The lingering question is: how can mobile devices and multimodality serve and support learning purposes in technology education?

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