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Social Media in Education: Contextualizing Teaching with Social Media in High School

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Institute of Education, Faculty of Social Sciences, University of Tartu, Estonia

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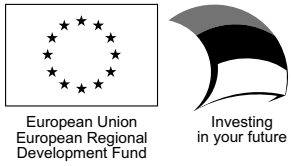

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LIST OF ABBREVIATIONS

SM	Social Media
TLR	Teaching, Learning, and Resource sharing
ZPD	Zone of Proximal Development
LMS	Learning Management System
MKO	More knowledgeable others
OMG	Oh my God
LOL	Lots of laugh
BYOD	Bring your own device
MKO	More knowledgeable other

LIST OF PUBLICATIONS

The thesis is based on the following original publications:

I. **Otchie, W. O.**, & Pedaste, M. (2020). Using social media for learning in High Schools: A systematic literature review, *European Journal of Educational Research*, *9*(2), 889–903.

II. **Otchie, W. O.**, Pedaste, M., Bardone, E., & Chounta, I.-A. (2020). Can YouTube videos facilitate teaching and learning of STEM subjects in high schools? *IEEE bulletin of the Technical Committee on Learning Technology*, *20*(1), 3–8.

III. **Otchie, W. O.**, Pedaste, M., Bardone, E., & Chounta, I-A. (2021). Contextualizing social media ecology and its pedagogical affordances: the perspective of high school teachers, *Electronic Journal for e-Learning, 19*(6), pp. 471–488, available online at www.ejel.org.

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V. **Otchie, W. O.**, Bardone, E., & Pedaste, M. (2022). Bridging the pedagogical gap between operational and contextual affordances with social media. *Encyclopaideia: Journal of Phenomenology and Education, 26*(62).

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Paper I: designing the study, formulating the research questions, planning and carry out the review procedure and analysis, contributing as the first author

Paper II: participating in the creation of the study design, participating in the formulation of the research questions, planning and carrying out the data collection and analysis, writing the paper as the first author

Paper III: designing the study, formulating the research questions, planning and carry out the review procedure and analysis, contributing as the first author

Paper IV: participating in the creation of the study design, participating in the formulation of the research questions, planning and carrying out the data collection and analysis, writing the paper as the first author

Paper V: designing the study, formulating the research questions, planning and carry out the review procedure and analysis, contributing as the first author

Related Paper to Research

Otchie, W. O., & Pedaste, M. (2019). Social media as a learning management system: Is it a tool for achieving the goal of "education for all?" *US-China Educational Review journal, 9*(2), 79–90.

1. INTRODUCTION

1.1. Overview of the Research Context

Historically, social media originated in the 19th century, but contemporary social media is defined by Web 2.0 (Mason, 2014). So, on May 24, 1844, the phrase "social media" was first used to refer to technology, with the first electrical transmission from Baltimore to Washington DC. The momentous feat of Samuel Morse set the ground for the creation of digital technologies and social media. Morse code has evolved into OMG, LOL, and other acronyms that are now commonly used in text messaging on most social media apps. A recent article in Washington Post reads "Before Twitter and Facebook, There Was Morse Code: Remembering Social Media's True Inventor" (Washington Post, 2017).

Indeed, the term "social media" acquired the meaning that it has today, along with the status of a buzzword, only with the advent of the Web (Allen, 2013; Boyd & Ellison, 2007). More specifically, it is with the so-called Web 2.0 that the term "social media" is often associated with. Acknowledging the historical roots of social media and its conceptual contiguity with the Web 2.0 is fundamental. It stresses that the term "social media" is anchored to the development of socio-technical practices, which relied, on the one hand, on a new paradigm of interactivity and, on the other, on "new programming languages, database architectures, and architectural standards" (Boyd, 2015, p.1). In this sense, historically speaking, "social media" (hereinafter SM) as a cluster of socio-technical practices went beyond the idea of the Web as a repository of information to embrace a vision that sees the Web as a "living web of humans and computer co-creating/produsing/prosuming a dynamic information and communicative sphere" (Fisher, 2018, p. 41).

From a more technical perspective, SM is a set of Web 2.0 computer-based technology that allows users to create and consume content in a seamless manner through the creation of virtual networks and communities (Kietzmann & Kristopher 2011; Mpungose, 2020; Obar & Wildman, 2015). Historically, Kaplan and Haenlein (2010) defined SM as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, which allows the creation and exchange of user-generated content". These include Facebook, WhatsApp, Twitter, Instagram, LinkedIn, Skype, Google Classroom, YouTube, and others (Calvert, 2015). However, as SM evolves, different user definitions, concepts, and implications emerge (Aichner et al., 2021; Greenhow & Chapman, 2020). These definitions are among several due to disagreements on what actually is defined as SM: This was as a result of the range of stand-alone and built-in SM services currently accessible (Aichner et al., 2021). However, several key concepts and phrases can be found in all of the definitions (Obar & Wildman, 2015). For instance:

- SM is an interactive Web 2.0 Internet-based technology (Kaplan & Haenlein, 2010; Obar & Wildman, 2015; The Law Commission, 2018);
- Many diverse applications run on the SM technology architecture or platform
- SM seamlessly enables users to create and share content, like written posts or comments, digital photographs or videos, and data generated by all web activity (Kaplan & Haenlein, 2010; Obar & Wildman, 2015);
- Users build service-specific profiles for the SM organization's website or app, which are developed and maintained (Boyd & Ellison, 2007; Obar & Wildman, 2015);
- SM facilitates in the creation and development of virtual networks and communities by linking an individual's profile with other persons or groups in the network (Boyd & Ellison, 2007; Obar & Wildman, 2015).

That said, SM comes with a range of different categories based on the design focus. To clarify the categories of SM in terms of *design focus*, on the one hand, the definition of SM covers a wide range of internet-based applications. On the other hand, they are not all born equal, because the design focus may change depending on the actual application. So, the applications like Skype and Zoom can be considered social media, but they clearly have a different design focus in comparison with Facebook or Instagram, which, though, also allow for video calls. For example, the design focus of Twitter, Tumblr and Pinterest is microblogging while that of Facebook, WhatsApp and LinkedIn is social networking. Also, video hosting is the design focus of Skype, Zoom, and Google Meets, while YouTube, Instagram, and Vimeo are media sharing sites.

SM is rapidly growing and increasing in popularity (Sreejesh, Paul, Strong, & Pius, 2020). As a consequence, SM is expected to have a significant impact on people's lives. Furthermore, the speed and convenience of interactions, as well as the level of participation, assist SM in expanding beyond its primary function of relationship building (Sreejesh et al., 2020). These capabilities make SM a powerful tool for socializing, networking, entertainment, and information dissemination (Zachos et al., 2018).

Meanwhile, most of these applications on SM were not specifically designed for education, yet their remote interactive, collaborative, and information sharing affordances could potentially be used pedagogically. However, literature assets that students use SM more for entertainment and socialization than for education (Ndaku, 2013). Education as used in the narrative refers to formal education within which learning is organized in institutions, curriculum-driven with the awards of credentials and this extends from elementary school to university and includes professional, technical, and vocational programs (Peters & Romero, 2019). Formal education in which teachers use tools pedagogically.

Subsequently, the term pedagogy, which refers to teaching strategies, has been used extensively in the narrative because the emphasis is on the teacher and how he or she employs SM in the teaching process. Hence, it is imperative to provide

some insight on the context in which pedagogy is employed. Pedagogy is the art and science of teaching (Cormack, 2021). Its Greek roots, on the other hand, refer to the teacher's approach to leading the class (Hamilton, 2009). Teachers use tools pedagogically. Hence, the focus is on teachers and therefore pedagogy is an important concept in this narrative. According to Robin Alexander (2010, p. 307), pedagogy is the "heart of the enterprise". He (2004) contends:

> Pedagogy is the act of teaching together with its attendant discourse. It is what one needs to know, and the skills one needs to command, in order to make and justify the many different kinds of decisions of which teaching is constituted. (p. 11)

However, Hamilton (2009) investigates the relationships and distinctions between pedagogy and concepts such as curriculum, etc. from the 15th century to the present. In his analysis of pedagogy, he made the following observation:

> . . . pedagogy entails a political orientation towards the good life, towards using a moral compass, and towards following prescribed courses. To characterize pedagogy as relating merely to ways or methods of instruction is, therefore, reductionist. It misses the point that teaching (including self-instruction) is a goal-directed activity where the goals and the means of reaching such goals are defined in terms of social values. In the process, human beings engage with initiation systems and rites of passage. They are socialized, acculturated, formed, led-out or self-directed into new forms of knowledge. Indeed, such purposive—reflexive—*drawing out* is a defining feature of *educational* practice. Moreover, each pedagogy is designed to lead, channel or steer learners in a particular direction. (p. 14)

Consequently, Hamilton's investigation revealed that pedagogy was the strategies used by teachers in the past, but it is interesting to note that it is still used in formal education today.

Also, the word *context* as used in the narrative denotes condition or circumstances that form the setting or event. According to Marton and Booth (1997), "We cannot experience anything without a context" (p. 89), and "the way a person experiences a situation or phenomena is conducive to learning" (p. 202). Context according to Marton and Booth: *Any learning situation or any situation at all has a structure of relevance for those who experience it, aspects of the situation that indicate what is aimed at, what it demands, and where it will lead (p. 180)*. So, the word *contextualize* as used in the narrative means to consider something in its context, which can help explain it. Hence, Contextualizing is the process of giving a situation new meaning in order to characterize it in terms of what could be done, but also excluding other interpretations of the required mode of action (Van Oers, 1998).

In essence, SM has potentials that could be used as a teaching and learning resource, however, the most critical issue is how this integration could be implemented in this contemporary times (Greenhow, Galvin, & Brandon, 2020). Meanwhile, regardless of the pedagogical potentials in SM, many students are using it

more for socialization than for learning (Ndaku, 2013). Given that students are already familiar with the SM applications, teachers and administrators may benefit from incorporating SM into their curriculum as a useful tool to increase student learning. However, the concept of using SM to connect teachers and students remotely and other stakeholders is a relatively new phenomenon.

According to literature, SM could be an ideal teaching tool because it is highly interactive, easy to use, inexpensive, and, most importantly, has an infinite global reach (Mpungose, 2020). This adds to the expanding pedagogical application of SM in teaching, learning, and administration, particularly among numerous universities and colleges worldwide (Chugh & Ruhi, 2018; Galvin & Greenhow, 2020). On the one hand, there is a relatively small volume of publications on the use of SM in high schools or secondary schools (ages 11–18 years). On the other hand, the purported pedagogical effects and advantages are not clear and consistent among studies (Greenhow & Askari, 2017). What is more, findings from other studies suggested that there is a risk linked with SM abuse (Grau et al., 2019), which may have psychological and societal ramifications. As a result, several studies have found that SM abuse is caused by the consequences of one's choice, maybe due to a lack of understanding of the critical role affordances and relationships play in determining the success of technology use (Gibson, 1955; Nagle, 2018; Oliver, 2016). Essentially, teachers' experience in terms of their ability to use technology effectively is critical in this context. The term "ability" as used in the text refers to a level of skill or intelligence (Oxford Advanced Dictionary). Here ability encompasses capability, competence, control, etc. and these skills are tacit (Polanyi, 1964). This means, much of these skills are needed to use digital tools. Polanyi refers to these skills as tacit because they can only be acquired through experience. On that note, the author of this thesis (hereinafter the author) agrees when Polanyi says that "…one needs to dwell in a tool in order to use it effectively" So, does the teacher have the knowledge, skills and experience to contextualize SM in a teaching and learning context?

Indeed, SM has impacted on our society, our culture, and our way of life. Individuals, institutions and communities can socialize, interact, collaborate, and share information in a virtual space without having to meet in person (Manca et al., 2021). Skills like communication, critical thinking, collaboration and others are part of the requirements that comes with the technology innovation. As a consequence, the European Commission (2017) proposed that institutions teach students such skills since they will need that in the 21st century to survive. This innovation, however, has not come without a cost: the consequences of surrendering our tradition. Social gatherings of families, communities and even institutions are being replaced by a virtual concept. What is more, our privacy has been violated. Individuals and organizations do not have ultimate control over the custody of their data (Bright et al., 2021). Furthermore, there is a decline in social skills (e.g. non-verbal communication skills), especially in children and anti-social behaviors such as cyber-bullying, sexteen, etc. are on the rise as a consequence of excessive SM ab(use) (Abaido, 2020; Rozgonjuk et al., 2018; Waters et al., 2020).

Nonetheless, SM's popularity has grown in recent years to the point that its use has shifted from its intended use as designed to a more current and contextual application among many public and private entities. For example, SM is used in product and service advertising and marketing (e.g., Auschaitrakul & Mukherjee, 2017; Gretry et al., 2017; Khorsheed & Othman, 2020); in the banking sector for remote banking and updates to customers on new products and services (Parusheva, 2017); as a tool for politicians, political debates, and potential threats to many democracies (Kamau, 2017; Yarchi et al., 2020); in governance (Singh et al., 2020); in music and entertainment (Breuer et al., 2020); in trade and industry (Xu et al., 2020); and in telecommunications (Xu et al., 2020). Furthermore, because of its affordances, SM is currently trending as the fastest-growing digital application, becoming a ubiquitous tool among many individuals (Sæbø et al., 2020; Yunus et al., 2019). Individuals are frequently seen connected in virtual chat rooms, living in a purely virtual environment. They can use SM to reconnect with old friends and meet new ones, watch movies, read the news, and read the posts of friends, politicians, and celebrities (Al-Azawei, 2019; Cooke, 2017; Parusheva et al., 2018). This is accomplished through the numerous and diverse affordances of SM. Some people use video calls, while others prefer voice or textual communication. Currently, Facebook has over 2.7 billion memberships, followed by YouTube with 2 billion users, WhatsApp with 1.5 billion users, and Twitter with 330 million active users (Statista, 2020).

Once many institutions have begun to see the potential of SM affordances, there is a growing concern for its adoption into the educational curriculum (Al-Qaysi et al., 2020). Previous studies have looked at how students are benefiting from SM use and how it has become a pedagogically useful tool (Carpenter & Krutka, 2014; Kenna & Hensley, 2019). For example, teachers use SM to engage students and monitor them during face-to-face class sessions. In essence, studies have shown that SM is an interactive digital tool with affordances that could potentially be used for teaching and learning (Carpenter & Harvey, 2019; Carpenter & Green, 2017; Chugh & Ruhi, 2018; Galvin & Greenhow, 2020; Manca & Grion, 2017; Manca et al., 2021). Regardless, there are discrepancies in SM and its impact on student's academic performance; whereas some studies focus on the positive impact of SM on students, others were more concerned about its detrimental impact on students (Chugh & Ruhi, 2018; Crimmins & Midkiff, 2017; Giunchiglia et al., 2018). As a result of these findings, there is a lack of agreement among stakeholders and scholars on this subject (Rozgonjuk et al., 2018; Waters et al., 2020). The biggest impediment to the integration of SM into the high school curriculum, however, has not been perceived hesitation by politicians or division of opinions among researchers but rather, teachers' lacking the ability to contextualize SM in their teaching (Aagaard, 2018; Haines, 2015). This means that, teachers are currently simply using SM in the classroom, which has little educational value. So, they use it for collaborative learning, sharing of learning resources, online group discussion, and so on, with a focus on operational affordances as designed, and that approach is consistent across contexts. Following Oliver (2016), the author may argue that SM, like any

technology, is neutral until the user determines the context of use. This means the effective use of SM is dependent on teachers' ability to contextualize it in their teaching activities (Aagaard, 2018). Indeed, for teachers to effectively use technology, it is important to move from operational use to purposeful use, which is not just obtaining information but providing the enabling environment and the thinking tools to help learners answer their questions (Januszewski & Molenda, 2008). Thus, the contextual use of SM goes beyond operational and technical uses. According to Den Beemt and colleagues (2020), there is great potential in using SM pedagogically, and teachers and students need to focus more on skills and experience which are tacit and can only be acquired through regular dialogue with the technology. To be able to contextualize a tool, one must dwell in the tool (Polanyi, 1964). Dwelling in the tool implies that one seemingly incorporates the use of a tool into his or her own practice.

The current doctoral thesis seeks to bridge the theoretical and practical divides by emphasizing the need of synchronizing the operational and contextual uses of SM. Thus, teachers will be able to use it effectively during their teaching and learning activities.

1.2. Goal of the Research and Research Problem

According to literature, most students, especially in higher education institutions, use SM for group discussion, sharing of academic resources, receiving updates, and feedback from faculty (Suana, 2018). Also, teachers appropriate SM's operational affordances, such as communication, interaction, collaboration, sharing of resources, information sharing, etc., into their teaching activities. However, the problem is that teachers do not use technology to change their practice. According to Linnasaari and colleagues (2020), teachers in different contexts still continue to rely on the traditional teacher-centered method with relatively less technology use. For instance, Rosin and colleagues (2021) in a recent study discovered that teaching and particularly teaching of science by Estonian teachers is more abstract, concept-driven and teacher-centered with relatively less technology at its core. Although Rosin and colleagues did not focus on SM, the fact that technology was a part of teachers' problem is worthy of consideration. This development resonates with studies conducted by Aagaad (2018) and Haines (2015) who assert that the problem teachers encounter with technology use in teaching lies in the lack of teachers' ability to contextualize technology for purposeful teaching and learning. For example, Bax (2003a), cited in Balchin and Wild (2020), claims that, to achieve normalization of technology for teaching in the classroom, teachers must use technology in the classroom in the same way we use a pen, seamlessly and without noticing we are using it. Also, in a related study, Puakpong and Lian (2015) emphasize the need for specific training of teachers in employing technology in pedagogically relevant ways in their teaching. These studies indeed show that the issue of teachers' ability to use technology pedagogically and SM, in particular, cannot be underestimated.

Hence, the goal of this doctoral thesis is to propose a conceptual framework for teachers across all secondary levels of education to be able to contextualize SM pedagogically in order to develop more student-centered teaching practices.

Eventually, the discussions on SM adoption and possible integration into the school curriculum have received some attention lately (see, e.g., Chugh & Ruhi, 2018; Daniel et al., 2016; Parusheva et al., 2018). Consequently, the recent COVID-19 pandemic has, on the one hand, exposed our weaknesses in technology use, especially in education, and, on the other hand, serves as a potential catalyst that will challenge us to address the issues in making remote learning a way of life rather than an option going forward.

1.3. Research Objectives

A great deal of previous studies and reviews on SM in education have focused largely on its use in higher educational institutions such as colleges and universities, with relatively less attention on high schools or secondary education (Fox & Bird, 2017; Malik et al., 2019; Mohammad et al., 2018; Tang & Hew, 2017; Voivonta & Avraamidou, 2018)). Indeed, a lot more studies on the same subject have also dealt with students' and teachers' attitudes and perceptions (Graziano et al., 2017; Haines, 2015; Rap & Blonder, 2017). Regardless of relatively more research on SM use in colleges and universities, the narrative on the issue of contextualizing SM in teaching remains a problem across all educational levels. However, the relevant literature does not give a consistent perspective on practical findings connected to pedagogical and creative technology use (Aguilar & Turmo, 2019). This is to imply that the literature has not been able to fully address how educators, particularly high school teachers, could contextualize SM pedagogically to gain value. This doctoral thesis aims to raise teachers' awareness of the importance of contextualizing SM in their teaching practice to maximize its potential. On the one hand, this thesis seeks to assist teachers in order for them to understand and appreciate the need for regular dialogue with SM to gain control of its operations and also discover more affordances. On the other hand, it will allow teachers to appropriate SM by contextualizing these affordances in their teaching process. The specific objectives of this research were the following:

- to determine the approaches by which high school teachers and students use SM for teaching and learning;
- to investigate how high school teachers use SM to teach;
- to determine how to conceptualize the use of SM in high school; and
- to investigate how teachers contextualize the use of SM in high school.

Four research questions (see **Studies I–IV**) were formulated to address the objectives of the research:

- What are the approaches by which high school teachers and students use SM?
- How do high school teachers teach with SM?
- How to conceptualize the use of SM in high school?
- How do high school teachers contextualize the use of SM?

This doctoral thesis was organized into four studies that were conducted in the context of high school education, with a focus on how teachers teach with SM and their perceptions thereof. The purpose was to bridge the perceived pedagogical gap between theory and practice, thus, synchronizing the operational and contextual use of SM in the teaching process. This will ensure that teachers develop the ability to pedagogically contextualize SM for purposeful teaching activities.

Five papers were written; the first, second, third and the fifth have been published. The fourth paper is undergoing peer review at the moment.

Paper I (Otchie & Pedaste, 2020), a literature review. This was to find the approaches by which teachers and students use SM for teaching and learning.

Paper II (Otchie, Pedaste, Bardone, & Chounta, 2020), an empirical study. Essentially, this was to get acquainted with STEM teachers' perspectives in teaching with YouTube videos.

Paper III (Otchie, Pedaste, Bardone, & Chounta, 2021), an empirical study, focused on how teachers share their experiences and perspectives about teaching with SM. This research paper was aimed at discovering the issues regarding how teachers teach with SM.

Paper IV (Otchie, Bardone, & Pedaste, submitted), a theoretical review. The aim was to expand the theoretical discussions on the affordances and contextualization of SM tools. This resulted in the formulation of a conceptual model for using SM pedagogically.

Paper V (Otchie, Bardone, & Pedaste, 2022), an empirical study, a follow-up to the previous studies. It was aimed at comparing the conceptual model with how participating teachers were teaching with SM before and during the COVID-19 pandemic. This will provide the basis for proposing a framework for teaching with SM.

The focus of this doctoral thesis was assisting teachers to contextualize SM for purposeful teaching and learning. In doing so, the thesis will be addressing the pedagogical gap between the operational and contextual use of SM. This should reduce the uncertainties in teaching with technology and provide the opportunity for more teachers to use SM in their teaching activities. This could also help to maximize SM use pedagogically and minimize potential risks. Addressing the pedagogical gap could also contribute to promoting online

learning and easy access to more virtual and interactive learning resources to both teachers and students at a very affordable cost to all schools.

The whole thesis is framed into six chapters. Chapter one gives an introductory overview of the research while chapter two reviews previous studies in this context. This chapter also situates the theoretical underpinnings of the thesis. Chapter three focuses on the methodology and related considerations, looking at the research design, instrument, and research sample, among others. Chapter four deals with the findings from Studies I–IV with a focus on the two key concepts, *operationalization* and *contextualization*. Chapters five and six, on the other hand, are devoted to the discussion and conclusions, respectively.

2. THEORETICAL FRAMEWORK

2.1. Vygotsky's Social Constructivism

Vygotsky has been included in this subject not because he was directly involved in the SM narrative but because his contributions and philosophical stands on teaching and learning are a lens through which one could have a worldview about this research. According to socio-constructivist's worldview, human development is socially organized within which knowledge is generated either through communication or interaction or both (Schunk & Zimmerman, 2003).

Constructivism is a dominant school of thought in education and has left a major impression on the modern learning paradigm. According to constructivism, learning is an active process where learners actively construct knowledge rather than passively accepts information (Hof, 2021). Constructivism promotes student-centered learning which involves collaboration, socialization, and interaction. In essence, SM becomes an environment that facilitates contemporary learning skills because it affords socio-constructivism where teachers guide students to work collaboratively on a task (Novak et al., 2012; Pedaste & Leijen, 2018). Studies show that SM platforms like Skype, Facebook, Twitter and WhatsApp, among others, allow students to collaboratively hold virtual group discussions (Greenhow & Lewin, 2015; Manca & Ranieri, 2013).

In terms of active learning, Vygotsky's focus was more a social process in which the support of parents, teachers, peers, learning resources (e.g. technology), society and culture play a role in the development of higher psychological functions of the learner. John Dewey (1938), had the same perspectives on active learning. According to Dewey, curriculum should be relevant to students' lives and therefore leaning by doing and the development of life skills are crucial to children's education. During active learning, students play an active role in the construction of knowledge (Piaget, 1968; Vygotsky, 1978). Andrews and colleagues (2011) define active learning as the process where a teacher ends his/her teaching and allows students to actively and collaboratively work on tasks to enhance their understanding. This includes all learning strategies that engage the student. The flipped classroom is a type of active learning instructional strategy and a kind of blended learning which aims to increase students' engagement (Jensen et al., 2015; Santos & Serpa, 2020). In essence, it provides students with the resources via technology to read at home and become active during class time using the information to solve practical problems in class (Munir et al., 2018). Other methods of active learning include collaborative learning, inquiry-based learning, project-based learning, and technology-mediated learning. Here, activities of active learning also include discussion, teaching, brainstorming, note-taking, formulating questions, etc. However, within the active learning process, students are made to learn on their own, but the teacher and more experienced peers also assist these students in the active learning process. SM could also mediate in the active learning process such as watching interactive video on

subject-related topics. For instance, while watching the interactive video (e.g. hypervideo), a student is not passively receiving information, but he/she is called to interact by answering questions, participating in quizzes, etc.

Vygotsky (1978) argues that students learn through social interactions by active engagement with their teachers or more knowledgeable others (MKO). In a study, Foldnes (2016) observed that active learning methods such as students learning by watching interactive videos instead of the traditional methods can enhance their learning without limitation to space and time. Here, SM makes an effective tool to facilitate active learning because it is more interactive and engaging.

Again, Vygotsky argues that social interactions enhance cognitive development. According to him, learning becomes more effective due to students' interactions with their teachers, MKO, or even with interactive learning resources (e.g. technology). Here, SM affords users and in this case teachers and students to learn and know more (Manca et al., 2021). This supports the views expressed by Vygotsky (1978), that teaching and learning will be effective if teaching is more interactive, student-centered and more models or artifacts are used.

Indeed, Vygotsky's desire for interactive teaching and learning by scaffolding is highlighted in his zone of proximal development concept (ZPD): A conceptual learning zone which explains the difference between what the learner can independently do and when provided with assistance or scaffold.

In this context, it is useful to distinguish between scaffolding as a process and scaffolds as tools and objects. Scaffolding refers to the process of internalizing relevant skills and information through dialogue and thoughtful customization of support. The scaffolding process is theoretically anchored in the Vygotskian sociocultural approach of sociocultural interactions.

Scaffolds, on the other hand, are tools that aid in the completion of a given task (Puntambeker, 2021). Scaffolds, as a result, have a more limited interpretation, referring simply to an intervention or tools supplied to pupils in order for them to accomplish a task (Pea, 2004; Stone, 1998b). Scaffolds are tools like technology (SM), but they can also be social, involving human relationships.

Technologies, artifacts, curricula, and routines are examples of tools (Puntambekar, 2021) which help to frequently address expected problems of the student (Pea, 2004). Tools can perform a variety of roles, including attaining shared knowledge of common goals, offering cues, and providing structure to encourage collaboration and articulation. Structured learning, for example, is one technique by which tools such as technology enhance learning. Structuring assists students by breaking down a complex activity and directing them through the steps required to achieve it (Reiser, 2004), for example, by providing assistance for engaging in authentic scientific procedures (Belland et al., 2015b; Xenofontos et al., 2018).

Tools can also act as scaffolds by giving alternate representations, such as visualizations, to assist students in understanding complicated processes (Lu et al., 2010; Puntambekar et al., 2003; Suthers et al., 2001). For a lesson to be more effective, it must be interactive, interesting and demonstrate some real-life scenarios (Kumpulainen et al., 2018; Mohammad et al., 2018). For example, in a

biology lesson on photosynthesis, the teaching will be more impactful and resonate with the students if the class had the opportunity to watch a video of the entire process. This video affords the students to visualize spatial imagery of the entire biological, physiological and chemical processes that simultaneously occur during photosynthesis. The same applies to the teaching of topics such as the solar system, atomization, bonding, and the marine ecosystems, among others. So, watching interactive video on these scientific topics and concepts helps widen students' imagination, enhances their understanding, and motivates them a lot more to pursue science at the university. In essence, the simulation of previously abstract topics brings some illumination into the learning process. Therefore, using interactive video in teaching avoids the situation in which students passively receive content. They actively participate in the learning process through quizzes and group work. For instance, all interviews the author had with teachers revealed that, regardless of the e-learning LMS environment in all Estonian schools, teachers continue to use SM resources to supplement their teaching. While all of the participants agreed to using YouTube videos at some point in their teaching process since the videos are engaging, they also admitted that they utilize them to facilitate teaching and learning. According to most of teachers interviewed, YouTube video forms part of their teaching toolkit, since they use it daily to teach.

It is important to understand that, while the technology (tools) gives many various types of support, the support supplied is best described as "differentiated" (Tabak, 2004)-that is, each technology as in use is distinct and provides support for a certain activity.

2.2. Gibson's Affordance Concept

The ecological concept of affordance, which is more focused on our relationships and perceptions with the environment, resonated with this research (Gibson, 1979). Gibson defines affordances in his original text as follows: "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill … These affordances have to be measured relative to the animal" (see Gibson, 1979, p. 127). This means one's ability to discover as many affordances as possible in one's environment could be precisely due to one's relationship with the environment. Hence, the environment elicits multiple affordances (Thill et al., 2013). So, according to Jarzabkowski and Pinch (2013):

> (…) any object may afford multiple possibilities that are beyond those purposes for which it was designed (…). That is; an object may be repurposed in situated human interactions (…). For example, a chair affords more activities than the designed purpose of sitting, such as being repurposed as a step for reaching a high object, as a lock under a door handle, as firewood when broken… (p. 582).

That said, affordances can be classified as explicit (perceptible), implicit (hidden), or false. For explicit affordance, the action comes directly from the object's characteristics. Explicit affordances are built on well-known and common prompts

that direct the user to a specific action. For example, if you see a button built as an obviously clickable element, i.e. aesthetically similar to buttons in the real world, you know you may interact with it by clicking or tapping it. If it is accompanied by text or icons, the affordance becomes even clearer: it notifies you of the system's feedback. For instance, the design functions and the physical environment/interface of SM makes perceived affordances more explicit. However, in the case of implicit affordance, the action is not too obvious. Implicit affordances are not readily apparent. They are hidden and can only be revealed through a specific sequence of user actions. Thus, making the action more implicit or tacit. So, a situation where the user/agent could discover these hidden affordances will be based on one's encounter with the object. A relationship with the object is key in this situation. Thus, agent-object regular dialogue. False affordance on the other hand has to do with an action that is perceived by the agent but does not actually work as expected perhaps due to faulty design or systemic dysfunction.

That said, it is important to note that, the user's interaction with the object may have some impact especially about how he/she perceives the object. This will as well impact his/her attitude. In such a scenario, the user is motivated (in the case of positive perception) to investigate further the object's hidden affordances as a first step toward contextual use. In a case of effective teaching with SM for instance, there is an interplay between the user (attitude, perception, etc.), the object, and the context. This makes contextualizing SM appears clouded with some degree of uncertainty, which makes it open and might go either way... *for good or ill*. Fundamentally, both explicit and implicit affordances are required collectively. Even though Gibson's focus was on visual perception, it perfectly fits the concepts of teaching with SM.

Currently, there are more studies on affordances as a concept in analyzing how SM impacts the lives of people, society, and institutions. Several scholars from diverse disciplines have conceptualized different kinds of affordances based on Gibson's original concept (Bareither & Bareither, 2019; Costa, 2018; Hutchby, 2014).

Meanwhile, earlier studies on affordances on digital technology tend to focus on the properties of a technology and how it impacts social interaction (Hutchby, 2001, 2014; Wellman, 1999). In the context of technology, Gaver (1991) defines affordances as independent, integral and physical features an object possesses that are compatible with a user's possible accomplishment. Similarly, Krejin (2004) views affordances in the context of SM as properties in a computer-mediated environment that enhances learners' social connections.

That said, although Gibson's (1979) focus was more on relationship and perceptions, his affordance concept rekindles the debate on the significance of the relationship and how it impacts any environment, be it ecological, technological, or social. According to Lanamäki, Thapa, and Stendal (2015), affordances are established through interaction with an environment, and this may involve learning, creative thinking, exploring through trial and error, etc. And of course, our regular interaction or dialogue with these environments enables us to discover

a range of affordances that were hitherto unknown (Gibson, 1979). This is what Gibson described as a *range of action possibilities*. For example, a teacher's regular interactions with interactive digital videos (e.g. YouTube videos) enable him/her to discover more *affordances* in the videos. That these videos can provide 3D visualization which could help to further explain the previously abstract scientific concepts. Also, the videos give different perspectives on the topic which enhances students' understanding. In essence, these affordances contribute to making teaching more interactive, interesting, contextual and purposeful (Greenhow & Askari, 2017; Januszewski & Molenda, 2008).

Indeed, just like any tool, SM remains neutral until one decides to use it for either *good* or *ill* (Gibson, 1979). So, on the one hand, interactive digital video environment could be used by teachers and their students to watch aerobics or sports. On the other hand, the same environment could be used to stream videos about different ecological habitats, a topic in biology. In this situation, the pedagogical relevance of the topic to the students must be the goal and focus of the teacher. Even though aerobics or sports could offer some useful lessons in terms of physical fitness and, of course, entertainment, it is not contextually pedagogical. This could lead to addiction through abuse. However, the pedagogical significance does not rest in the fact that the teacher and students watched a video on an ecological topic. Here, the pedagogical affordances in this context have to do with several things: for instance, the knowledge, ability and competence of the teacher to select the ecological topic suitable to their level and, of course, in tandem with the syllabus. Indeed, a video must not be too long and should provoke some discussions and activities among students. Besides, the video positively impacts on their learning, since it was able to immerse them in observing these phenomena in a spatial virtual environment free of risks or hidden costs. Certainly, the discovery of these pedagogical affordances in teaching with SM can only be possible after teachers establish a strong relationship with SM through regular interactions.

2.3. Indwelling, Polanyi's Tacit Dimension Concept

An important concept, complementary to Gibson's notion of affordance, is *indwelling*, which was introduced by Polanyi (1964) in the context of his theory on tacit knowledge. According to Polanyi, our body is the instrument by which we know the world. This concept comprehensively proposes that our knowledge is a kind of indwelling (Nirmal, n.d.; van Pelt, 2011). This means that we internalize our hints (problems) and dwell in them to make them part of our body and cognition. This makes us know and understand the hint (problem) better to enable us to proffer effective solutions. There are different kinds of knowing. One could speak about knowing a person or knowing a fact from fiction. And another form of knowledge could be theoretical knowledge as against practical knowledge (Al-Azawei, 2019; Bohloko et al., 2019; Stevenson et al., 2019; van Pelt, 2011). Indeed, one could also focus this narrative on knowing about a tool, in this case SM.

To clarify this dimension of knowledge, Polanyi categorized knowledge into two kinds: (1) tacit knowledge and (2) explicit knowledge. Tacit knowledge (implicit knowing) is a form of knowledge that is not transferable to another person. Knowing tacitly according to Polanyi means, *we can know more than we can tell*; a kind of knowledge one acquires like the experience of playing a guitar or ice skating. Of course, traditionally, this is always the case when learning a profession. Thus, apart from gaining the theoretical and practical knowledge of the profession which is fundamental, there is this internal knowledge one develops which is experiential, insightful and cannot be documented (Zmyślony, 2010). This is personal wisdom that emanates from learning, skill and experience and is more difficult to codify or share, for example, intuition, insights, etc. (van Pelt, 2011). Burke (2020), cited learning to ride a bicycle as an example of tacit knowledge since it relies on experience and not by just reading the manual. This means that I can say that I know how to ride a bicycle, but this does not mean I can explain how I manage to keep my balance when riding.

Explicit knowledge, unlike tacit knowledge, can be transferred from person to person, as this kind of knowledge can be codified in books, reports, etc. Thus, it can be easily articulated, written down, and transmitted (Burns, 2021). Polanyi believes that the approach to innovation is fundamental to all human knowledge. He writes:

> Because our body is involved in the perception of objects, it participates thereby in our knowing of all other things outside. Moreover, we keep expanding our body into the world, by assimilating to it sets of particulars which we integrate into reasonable entities. Thus do we form, intellectually and practically, an interpreted universe populated by entities, the particulars of which we have interiorized for the sake of comprehending their meaning in the shape of coherent entities. (Polanyi, 1964, p. 29)

So, knowing in the form of explicit knowledge about a tool could be accessible through books, digital texts, etc. However, to get hints about how to contextualize the tool meaningfully, one needs to dwell in the tool, thus making the tool become an extension of one's body and cognition. The experiences and insights gained in this encounter or relationship become internalized and cannot be transferred or documented. Polanyi coined the word *indwelling* as another dimension of tacit knowledge.

Essentially, indwelling is an experiential phenomenon that could only be attained through a personal encounter with the tool or situation; that is why it forms another dimension of tacit knowledge. Polanyi compared it to "the use of a probe to explore a cavern or the way a blind man feels his way by tapping with a stick … to maintain and indwell an interior visualization of the unseen cityscape" (Polanyi, 1964, p .12). In both circumstances, as soon as one begins to probe for something of interest, the stick no longer feels distinct from oneself (van Pelt, 2011). Polanyi further explains that, as the stick or probe is pushed to touch an object of interest, one begins to feel the sensations, as if his hand and the stick are connected, which

appears like an extension of the hand. Here, one's sensory and visual neurons perceive the stick as a focal point and as a medium through which nervous transmissions occur between one's hand and the stick. In so doing, the blind man can feel his way as a result of the sensory connections between the stick and his fingers. During the process, according to Polanyi, all sensations shift to the background and become remote, which he describes as subsidiary to the sensation of touch that is being experienced by the body through the stick.

For example, the design of SM with its operational (technical) affordances will certainly require explicit knowledge to learn and understand its use and operations. However, one requires tacit knowledge to be able to use SM contextually. Tacit knowledge that is required to use SM could only be gained through experience as a result of regular and consistent use. This is what Polanyi describes as *dwelling in the tool*. Thus, dwelling in a tool implies that one seemingly incorporates the use of a tool into his or her own practice.

3. METHODOLOGY

This chapter provides an overview of the interconnections between all the sections of this doctoral thesis (see Fig. 1). Then, it looks at the research design, participants' demographics, and sampling. This is followed by data collection, data analysis, and data integrity.

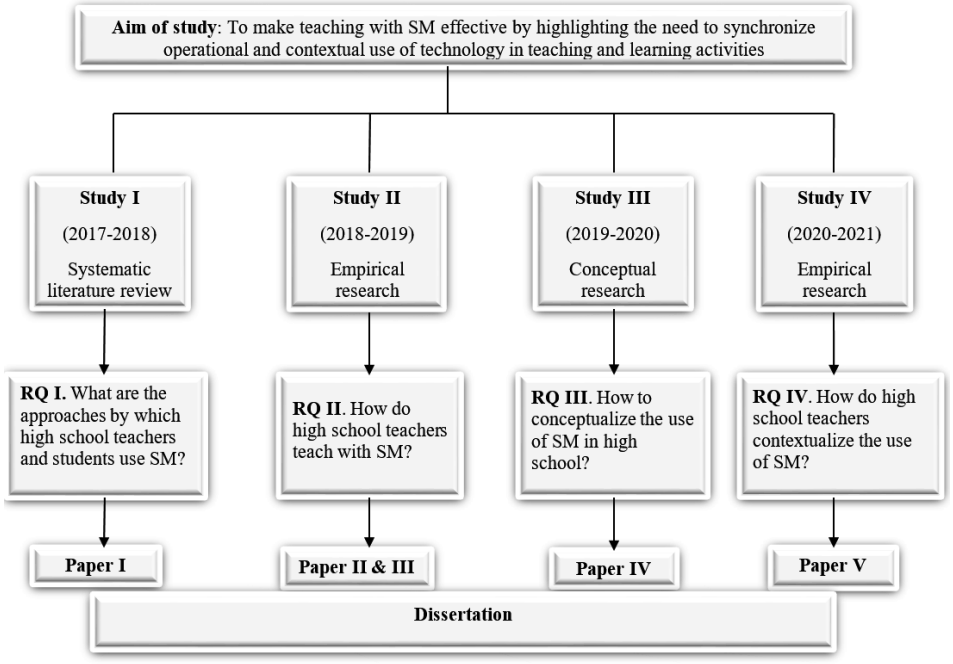

Figure 1. Overview of the Interconnections Between the Studies

3.1. Research Design and Rationale

For the research approach, a qualitative study was adopted because it allows participants to share their insights, perspectives, and experiences with the researcher (Creswell, 2014). Qualitative research allows one to articulate, plan and structure the research. Hence, a research design is an overall approach to how the research connects theory and concepts with research questions and the design of data collection methods and analysis (Ravitch & Carl, 2019). This approach is shaped by concepts, beliefs, and the relationships that underpin this research (Ravitch & Carl, 2019).

This doctoral thesis was organized along with four studies with different research designs. **Study I** was a conceptual study, where qualitative systematic literature review was used to review selected literature on SM use in high schools. A systematic literature review was used for Study I because it helps to have an

overview of studies done in this context as well as to understand the approach by which teachers and students use SM. In **Study II**, two empirical studies were conducted with qualitative content analysis as research design. Content analysis was an appropriate design because it allows the researcher to determine the presence of certain themes, categories and concepts within the given data. According to Hsieh and Shannon (2005), qualitative content analysis is a "research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (p. 1278). One advantage of this method over the others is that it is useful for analyzing a large volume of textual data through coding to identify patterns or themes (Ravitch & Carl, 2016). **Study III** was a theoretical research design that sought to explain the concepts in technology use for teaching and learning. The choice for this type of study was due to the fact that only a few studies had been done on this concept. So, it helps to generate operational definitions and provide a better-researched model. It is a type of research design that focuses on explaining the concepts of the study in detail (Creswell, 2014). **Study IV** was an ethnographic research design in which the researcher studied the shared patterns of behavior, language or actions as he/she interacted with participants in their real-life environment (Creswell, 2014). Data gathering was by observing participants, document collection and interaction through face-to-face interviews or in an online environment which was recorded on a digital device (Creswell, 2014; Ravitch & Carl, 2016).

Study I was a literature review conducted to have an overview of previous studies and to assess the approach by which high school teachers and students use SM.

The results from the review revealed that using SM for teaching and sharing of resources was among the least in the 7 approaches found. An article, Paper I on this study was published.

So, this led to an empirical **Study II,** which afforded high school teachers to share their experiences, perspectives and insights about teaching with SM. Two articles were written on this study, both of which have been published. Thus, Paper II (Otchie et al., 2020) and Paper III (Otchie et al., 2021), respectively.

In Study II, there was a need to disambiguate the term *use of social media*, and that led us to discover the operational and contextual affordances concepts.

Study III was aimed at developing a conceptual framework based on the theories used in the study. The study yielded Paper IV (Otchie et al., submitted).

Investigating the last phase in the framework required another empirical study, **Study IV**. Here, another interview was conducted with teachers to explore how they contextualize SM and other technologies in the context of their lessons, resulting in Paper V (Otchie et al., 2022).

Study IV was qualitative research exploring high school teachers' use of SM in teaching. The aim was to gain some understanding of their perspectives (Creswell, 2014). The details of the narrative unfold below.

3.2. Sample

The selection of participants for the research was based on their knowledge, experience and competencies as high school teachers and their understanding of the phenomenon being studied (Creswell, 2014; Ravitch & Carl, 2016). Thus, the criterion for selection and inclusion was based on teachers' knowledge about technology use in education. But most importantly, teachers' experience in teaching subject-specific lessons with technology and any SM app was a pre-requisite for their selection and inclusion (see Table 1). This made purposive sampling the appropriate sampling tool because it allows the researcher to select participants with the knowledge and understanding of the phenomenon being investigated (Creswell, 2014; Sandelowski, 1995). In a few instances, the snow-ball approach was also used as a few colleagues in our department gave referrals to prospective participants. As a requirement, teachers were to have not less than one year of experience in teaching with SM. Subsequently, an email was sent to schools in Tartu and Tallinn as well as to Estonian Science Teachers Association which contributed to getting participants form other counties across Estonia. This approach was to select from the population that is close to hand, thus, to make the sampling process convenient (Creswell, 2014)

In **Study II**, a semi-structured interview was used. This interview method allows teachers to be heard (Flick, 2006), and it is also appropriate for investigating teacher cognition (Adamson, 2004).

The 11 teachers who took part in the study were drawn from Estonian public and private high schools (see Table 1). The sample included Biology, Math, Physics, English, English Literature, and Arts teachers in grades 7, 8, and 9. Ten (90%) of the participants were female, whereas one (10%) was a male teacher. In terms of teaching experience, seven (64%) of the participants have between 10–35 years of experience, whereas four (36%) have between 2–9 years. Participants were given the option of choosing their preferred interview setup from a list of interview categories. While one participant chose face-to-face interviews, the majority chose an online video interview facilitated by Zoom (https://www.zoom.us/).

Table 1. Profile of Participants in Study II

Pseudo-nym *(N=11)*	**Years of Teaching**	**Years of Teaching with SM**	**Type of SM**	**Subject**	**Grade**
Jane	8	7	YouTube, Facebook	Biology	7
Kaja	10	8	YouTube, Facebook	Biology	8, 9, 10
Kristjan	35	8	YouTube	Physics, Math	8, 9
Evelin	20	7	YouTube	Arts, English	7, 8
Aivi	25	10	YouTube, Google Classroom	English	9, 10
Mirjam	16	5	YouTube	Math	9
Kristina	2	2	YouTube, Facebook	Biology	7, 8, 9
Zara	4	4	YouTube, Facebook, Google Classroom, Instagram	English, English Literature	7, 8, 9
Triin	6	6	YouTube, Google Classroom	Biology	8, 9, 10
Katarina	11	7	YouTube, Instagram	Arts	7, 8, 9
Gerli	15	8	YouTube, Google Classroom	Math	9, 10

In **Study IV,** the goal was for teachers to demonstrate how they prepare and teach their lessons using technology including SM. Snowball sampling was used in a few occasions, as well as purposeful and convenience sampling. Email responses from selected secondary schools in Tartu and Tallinn, as well as the Estonian Biology Teachers' Association, resulting in 13 teachers agreeing to participate in the study. These 13 participants were interviewed remotely through Zoom using a semi-structured interview consisting of open-ended questions and they were also requested to present samples of the lessons and videos they used to teach. All 13 participating teachers had between 3–35 years of experience in teaching and 3–26 years of experience in teaching with technology, respectively. (see Table 2). Here, teachers having experience in using technology is important requisite because such skills could be applied in the use of SM as well. This means all participants were professional teachers with at least a master's degree in education, and a couple had two master's degrees, one in education and the other in science. Also, one participant had a doctorate degree in physics. In terms of gender distribution, there were four males (31%) and nine females (69%).

Table 2. Profile of Participants in Study IV

ID	Gender	Age	Highest Qualification	Years of Teaching	Subject	Grade	Teaching with Technology (Yrs)
ST01	F	31	MA Ed	10	G, NSc, B	7–12	10
ST02	F	31	MA Ed	5	B, C	10–12	5
ST03	M	41	PhD Physics	3	P	9–12	3
ST04	F	30	MA Sc Ed	7	B, C	7–12	6
ST05	F	44	MA Comp Sc	4	IT, R	7–9	4
ST06	M	59	MA Sc Ed, MA Ed Tech	35	P, M, R	8–9	15
ST07	M	51	MSc (Eco), MA Sc Ed	26	B, BT, Bot	10–12	26
ST08	F	40	MA Ed	8	M	7–10	8
ST09	F	42	MA Sc Ed	10	B, C, NSc	7–9	10
ST10	F	45	MA Ed	20	E, ELit	8–10	14
ST11	F	31	MA Ed	9	A	8–10	9
ST12	M	42	MA Sc Ed	14	B	8–10	14
ST13	F	30	MA Ed	4	E	7–9	4

Hence, in **Studies II** and **IV**, a total of 24 Estonian high school teachers participated. Their age range from 24 to 54 years and having between 2–35 years of experience in teaching. In terms of gender, there were 5 men and 19 women; they taught grades 7–12 (learners aged 13–18). The subjects they taught included Arts, English Language, English Literature, Mathematics, Geography, Biology, Chemistry, Physics, and Robotics.

Interviews for study II were conducted online in Zoom, except for one participant who opted for a face-to-face approach. The data collection process continued until it was noticed that participants were no longer providing any new information. Then came the realization that the interview had reached its saturation point (Corbin & Strauss, 2014). In terms of privacy and ethical considerations, this was clearly stated in the emails sent to participants, and they were informed about their identities being kept anonymous. Also, participants signed a form of consent to indicate their acceptance and participation in the study. In the case of study IV, all interviews took place via Zoom platform, since that was the only option. The consequence of the Covid-19 pandemic lockdown where schools moved teaching and learning onto virtual platforms.

In both interviews (study II & IV), relatively small sample sizes were recorded. However, the author settled on this small sample size because size was

not the focus in a qualitative study; rather, having a small sample size offers the researcher the opportunity to collect detailed information about the phenomenon (Creswell, 2014). Another reason why the sample size was not the focus was the fact that a qualitative study does not generalize but rather focuses on the researcher's interaction with participants to gain insights about their perspectives and understanding of the phenomenon being investigated (Creswell, 2014; Ravitch & Carl, 2016).

Estonia was used as the setting for the narrative for the fact that Estonia is regarded as one of the world's top digital societies due to its high degree of technology penetration and utilization (OECD, 2019). Similarly, a study found that 98% of Estonians use the Internet to some extent, and 57% are active SM users (Karasov, et al., 2020) Also, digital technology forms an integral part of Estonian science education. This was evident in the PISA test results (PISA test, 2018).

Meanwhile, the Bologna process has changed the structure and content of teacher education and training in EU member states like Estonia (Sarv, 2014). In terms of teacher training and certification, Estonia implemented the Bologna old decrees established in 1979 and 1995, which demand all teachers to hold a Master's degree in order to qualify as teachers (Sarv, 2014). All other teachers must attain a Master's degree (BA 180 + MA 120 ECTS) (Sarv, 2014). Thus, the minimum requirement for subject and class teachers in general education is a 5-year Master's degree (Eisenschmidt, 2011; Ministry of Education and Research, 2014).

Currently, the initial training of Estonian teachers has been carried out by the universities. Tallinn University and the University of Tartu, along with their colleges, currently offer programs leading to the award of a teacher qualification (Eisenschmidt, 2011).

Additionally, the importance of science education cannot be underestimated. Hence, the purpose of science teacher education is to embrace a more modern and pragmatic student-centered or constructivist teaching approach. Thus, teachers using student-centered approaches are more likely to value students' ideas and encourage them to construct, develop their own knowledge, and have some autonomy (Rosin et al., 2021), as opposed to the traditional teacher-centered approach, in which teaching is basically the passive transfer of knowledge, skills, and values to the students (Rosin et al., 2021). Meanwhile, teachers have the option of using both methodologies. However, research suggests that a teacher-centered approach is frequently employed by science teachers including Estonian science teachers (Duru, 2015; Henno et al., 2017; Kask, 2009; Rosin et al., 2021)

Technology is an essential component of all levels of education, and the use of LMS and digital resources is prevalent in everyday teaching and learning in Estonian schools. Outside of school, there are additional learning centers where students can satisfy their educational interest. The Estonian National Museum, Nature House, and the AHHA research center, a scientific lab where children of all ages can learn about space and do hands-on experiments in Physics, Chemistry, and Biology in the framework of technology simulations. All of these contribute to Estonian education being more technologically oriented (Ministry of Education, 2014).

3.3. Instrumentation

Research instruments can be described as tools or protocols a researcher develops or adapts from other studies to collect, measure and analyze data related to the research (Ravitch & Carl, 2016). Research instruments include tests, surveys, scales, questionnaires, prompts, or checklists that guide the research (Ravitch & Carl, 2016). That said, the quality and integrity of this research depends on the research instrument. Hence, the choice of research instrument is crucially important since it depends largely on the type of research data one needs to gather. For a qualitative study, we need an instrument that can allow participants to share their insights, perspectives and challenges with SM. So, for Study II, an existing instrument for qualitative study was adapted and modified (LeCompte & Schensul, 1999). This was reviewed by experts and revised before it was used for the interview (see Appendix A.1). In the case of study IV, the instrument was developed from scratch (See Appendix A.2). According to Ravitch and Carl (2016), trustworthiness is an active systematic process used in research right from the research design to writing the results. So, to ensure the trustworthiness and validity of the instruments, the following steps were taken: the instrument for Study II was revised after it had been reviewed by two experts in research (Creswell, 2014; Ravitch & Carl, 2016). In the case of Study IV, the instrument was developed, piloted and then revised based on the feedback received (Ravitch & Carl, 2016). For Studies II & IV, interviews were the main instruments used for the data collection. The main purpose of interviews in a qualitative study is to understand the participants' lived experiences, insights and views and how this impacts the phenomenon being investigated (Creswell, 2014; Ravitch & Carl, 2016). The interview protocols used are a set of questions and prompts designed to guide the line of questioning during the inquiry to elicit the information needed from participants and also to keep on track (Yin, 2018). The interview questions used were semi-structured and open-ended. This allowed participants to share their experiences, insights, and perspectives. According to Creswell, the more open-ended questions, the better, because this affords the researcher to listen carefully to what participants say and do in their environment.

To validate the instrument for study IV, a pilot study was conducted on August 18 and 21, 2020 respectively, with two teachers, one a colleague from our Institute and the other a former colleague teaching in the UK. A pilot study is important for the improvement of the quality and efficiency of the main study (Creswell, 2019). Hence, the intent and purpose of the pilot study was to test the suitability and validity of the questionnaire. Also, this allowed the author to rehearse the interview. According to Ravitch and Carl (2014),

> Rehearsing helps practice your interviewing style as it relates to the specific study and set of questions; it helps you to become more comfortable with the interview questions and process in a way that cannot happen until you try out the instrument in real-time with real people. (p. 113)

Furthermore, this pilot test is to establish that research instruments can be administered to participants without inconsistency (Creswell, 2014). Participants were briefed on the purpose of the study before the pilot interview. They were also given the chance to ask questions at any time during the proceedings. Participants were assured of their confidentiality and anonymity. There were a few questions raised by participants during the pilot interview that needed clarification. On those questions, notes were made for future revision. Following the pilot interview, participants provided input that was used to revise the instrument in preparation for the main study. Finally, the updated instrument was shown to an expert once again, who authorized it before it was used in the main study.

3.4. Data Collection and Analysis

A semi-structured questionnaire was used to interview high school teachers about their perceptions, insights and concerns about teaching with SM. Two interviews for **Studies II** and **IV** took place from May 2019 to September 2019 and September 2020 to December 2020, respectively. A total of 24 teachers participated in the study. Teachers' experience with SM is crucially important for this study because it enables the author to understand and appreciate how teachers teach with these tools and the benefits and constraints they encounter.

For **Study II**, 11 participants were asked open-ended questions (see Appendix A.1) to elicit an explicit perspective on their experiences of teaching with SM. These questions were in line with the research questions in Study II. The interview lasted 30–45 minutes. All the interviews were video-recorded and notes were taken in some instances. The questions for the interview in **Study IV** (see Appendix A.2) were a follow-up to Study II, where the focus was on observing how teachers prepare their lessons, teach, and how they assess their students using SM and other interactive digital tools.

Essentially, the researcher wanted to see how teachers use SM in the context of their classroom teaching. So, purposive and convenience sampling methods and, in a few cases, a snowball, were used to select the participants (Creswell, 2014). In **Study IV**, 13 high school teachers across Estonia responded to the invitation to participate in the intervention. The process involved semi-structured interviews, observations, and note-taking. Unlike in **Study II**, participants in **Study IV** were not given the option to choose the format for the interview. Instead, all interviews took place virtually through the Zoom platform due to the COVID-19 pandemic lockdown. Also, unlike in **Study II**, the enthusiasm to participate in Study IV was relatively high. The interview process began in early September after a pilot interview was conducted to validate the instrument for the study IV (Creswell, 2014). Before ending each interview, participants were debriefed. An overview of the data collection is shown below in Table 3.

Table 3. Data collection overview

Study	Research question	Sample	Instrument	Study design
Study I A systematic literature review	What are the approaches y which high school teachers and students use SM?	10 articles	Electronic database search	Qualitative content analysis
Study II Empirical study	How do teachers teach with SM?	11 high school teachers	Semi-structured interview questions	Qualitative content analysis
Study III Conceptual study	How to conceptualize the use of SM in education?	Articles on Vygotsky, Gibson and Polanyi	Review of theories of Vygotsky, Gibson, and Polanyi	Concept formulation
Study IV Empirical study	How do teachers contextualize the use of SM?	13 high school teachers	Semi-structured interview questions	Ethnography

For **Study II**, content analysis was employed as a tool to analyze the qualitative data. According to Powers and Knapp (2006), content analysis is a common term used to refer to many different strategies used to analyze text. The reason for settling on this method was that it allowed the researchers the freedom to manipulate data and ultimately identify, analyze and report patterns within the data to make some rationalization of the phenomenon (Creswell, 2014). Furthermore, content analysis assisted in determining the presence of specific words, ideas and concepts within the transcribed text, as several authors have emphasized (Creswell, 2014; Ravitch & Carl, 2016; Vaismoradi et al., 2013). Also, the reliability of the data is a vital component of the research process (Ravitch & Carl, 2016). As a result, the following actions were taken to ensure the reliability of the data analysis.

First, as previously mentioned, all the videos were checked to ensure good quality sound and pictures before transcribing the recorded interview verbatim (word for word). All the transcripts were checked to ensure that they had correct margins and adequate line spacing and were legible for coding and note-taking. Also, a few screenshots from videos some participants showed to me during the interview were added. The addition of screenshots was fundamental for the researcher to better understand what the teachers actually referred to. Indeed, screenshots were not the only source of data, thus, their verbal articulation was also significantly important. According to Gale and colleagues (2013), transcription is a good opportunity to be immersed in the data as the researcher tries to determine the presence of certain words, themes or concepts and establish the relationships among them. So, to be familiar with the interview, the audio was played and listened to more than once in most cases, and checking the transcripts while listening to the audio to ensure that the transcription was verbatim.

Second, after familiarization, each transcript was carefully read line by line and a paraphrase or label was applied (a code) that described the statements in that passage as important. According to Gibbs (2018), coding is how you define what the data you are analyzing is about. At this stage, *open coding* was used to start the coding process, i.e. inductively coding anything that might be relevant (Creswell, 2014; Gale et al., 2013; Ravitch & Carl, 2016). The purpose of the coding was essential because it helped to refine and fine-tune the data. Coding helps to segregate, re-group and re-link to consolidate meaning and explanation. Coding the data helps the researcher identify themes, patterns, and categories (Creswell, 2014; Gale et al., 2013; Ravitch & Carl, 2016).

In the case of **Study IV**, thematic analysis was adopted as a tool to analyze the data. According to Daly and colleagues (1997), thematic analysis is a search for themes that emerge as being important to the description of the phenomenon. What informed the choice for this tool was the fact that it gives the researcher the flexibility to work with data (Braun & Clarke, 2006). Similarly, Braun and Clarke (2006) view thematic analysis as a method for "identifying, analyzing and reporting patterns within data" (p. 79). To Rice and Ezzy (1999), it is a process that involves the identification of themes through "careful reading and re-reading of the data" (p. 258). Furthermore, the flexibility of this method makes it preferred

by researchers who desire to use rather a low level of clarification (Braun & Clarke, 2006). The analysis in Study IV followed the steps in Study II, except that during the coding, both inductive and deductive coding were used. The deductive coding began with the data analysis from the theoretical propositions and research questions to establish the codes. Essentially, deductive coding (see Figure 2) is pre-defined by existing theory. So, it is relatively easy to move to index.

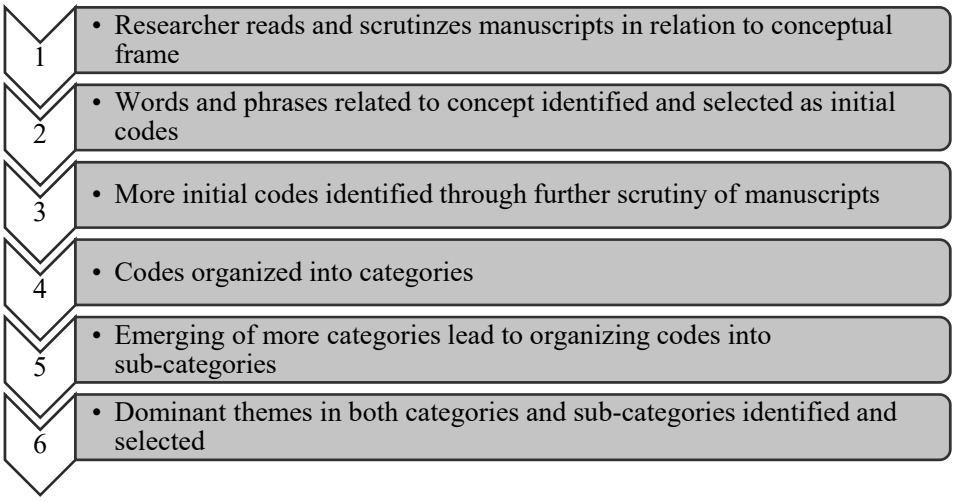

Figure 2. Schema for deductive coding

The next phase was the inductive process of data analysis which involved steps similar to what was used in **Study II**

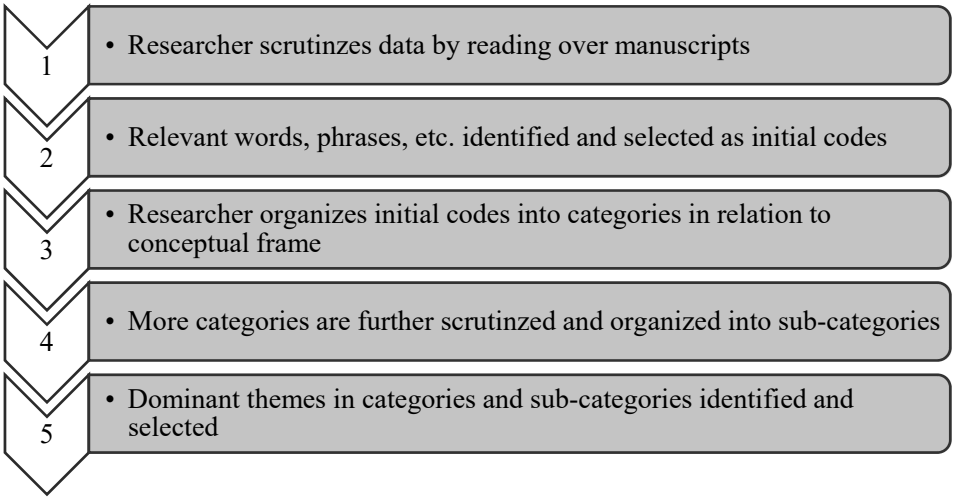

Figure 3. Schema for inductive coding

3.5. Trustworthiness of the Research

Integrity is one important characteristic a researcher must have. Indeed, this must reflect throughout the research cycle to establish the credibility of the research. Hence, for a research to be considered valid, it must pass the litmus test of credibility and trustworthiness. According to Ravitch and Carl (2016), trustworthiness is an active systematic process used in research right from the research design phase, through data collection and analysis, to writing the results. To talk about trustworthiness in research, some key characteristics such as credibility, dependability, transferability and confirmability cannot be underestimated. In research, credibility refers to how believable and appropriate a research account is, with an emphasis on the level of agreement between participants and the researcher (Schmidt, 2017). It focuses on honesty as well as the value of being a trustworthy researcher. The accuracy and reliability of the research results as well as the degree to which the process is reported are referred to as dependability. As a result, having someone from the outside to observe, inspect or criticize the process is beneficial (Polit & Beck, 2012). Transferability, according to Rolfe (2006), refers to how the analysis can be applied in different settings to achieve the same result. In qualitative research, transferability is essential. Several approaches were used to make the analysis reliable and trustworthy during this review. The techniques used are summarized below.

To ensure the credibility of the studies during the preparation phase, the following measures were adopted: First, two pilot interviews were conducted, after which the instrument was revised and authorized by a research expert. Elo and colleagues (2014) stressed the importance of pilot interviews and emphasized this approach. According to them, pilot interviews are useful in determining whether or not the interview questions are appropriate for obtaining rich data and thus, in determining whether or not the research questions can be answered. So, during the creation of the instruments for studies II and IV, there were consultations with research experts and then the pilot interview. Meanwhile, the issues of the author's professional background as a teacher and researcher and his biases cannot be underestimated (Creswell, 2014; Ravitch & Carl, 2016). However, being aware of these limitations made the author more responsible and focused to reduce any potential influence this might have on the interview.

The organizational phase is essentially the stage during and after data collection where multiple steps are taken systematically to ensure the research's integrity and trustworthiness. An interview protocol was used as a reference to avoid inconsistency during the interview. A good interview protocol is essential to getting the best information from the participants. Also, to ensure that the possibility of inconsistencies during data collection was minimized, all participants were provided with the same key questions as defined in the prepared semi-structured interview guide, thereby facilitating the research's dependability. Participants were also called in to help correct any problems contained in the transcript that may be due to a lack of consistency in the data, thus ensuring confirmability in the research.

Essentially, the reporting phase establishes the research's context. From the standpoints of trustworthiness and transferability, the researcher must explain the research's original context in simple and precise terms so that the reader can make an informed decision about the transferability of the findings (Guba & Lincoln, 1989). As a result, the analysis and reporting aspect should try to make sense of the results for readers in a meaningful and useful way. The most critical aspect of qualitative research, however, has received little attention: the presentation of results (Sandelowski & Leeman, 2012).

The use of quotes has been claimed to be effective. That said, quotations are needed to show the reliability in reporting (Polit & Beck, 2012). So, reports must represent the voices of the participants and the circumstances of the investigation, rather than the researcher's biases, motives, or perspectives (Lincoln & Guba, 1985; Polit & Beck, 2012). This was one of the reasons participants' quotes or indents are often used to denote their original statements in the transcribed text (Graneheim & Lundman, 2004). This contributes significantly to the credibility of reporting, especially in terms of demonstrating a connection between data and findings.

3.6. Ethical Considerations

The following are the four key measures taken to ensure that all ethical considerations were followed both before and after data gathering to ensure participant safety and protection:

(1) ***Trust:*** Research data is a crucial resource for human development. According to Given (2008), a substantial percentage of qualitative research involves acquiring data from people. As a result, the relationship between researchers and their subjects has an impact on the quality of their results. So, the initial stage was to locate potential volunteers for the research using purposive sampling and snowball. Then they were briefed on the aim of the interview and the fact that their role would be kept confidential in order to preserve a high degree of confidence. Subsequently, they eventually gave their consent to participate in the research.

(2) ***Informed consent***: During the selection procedure, the purpose of the research was disclosed to participants by email. After that, a consent form was offered to be filled out. As a result, their rights and duties as research volunteers were clarified. Before the interview, participants were reminded of their prior consent and reassured that their rights would be respected.

(3) ***Pseudonyms***: To preserve the participants' identities, pseudonyms were used (see Study II). In Study IV, participants' true names were replaced with codes for the same reason. These safeguards are primarily intended to provide people a sense of privacy and security. This was also stated in the consent form, which adds to the trustworthiness of our partnership.

(4) ***Data storage:*** All the video and transcript files were placed in a password-protected folder. A backup was produced and stored on an external storage device in a secure location. In addition, the transcripts were encrypted using a code. The pseudonyms and codes were also registered in a separate document to assure safety and security. However, once the results were released, the intention was to format the external storage system and delete any associated files.

3.7. Researcher's Reflexivity

In any qualitative study, a researcher's history, interests, position and experience could have an impact on the entire project, especially data collection and analysis (Creswell, 2014; Sword, 1999). Although such impact is unavoidable, it is critical to situate the research by elucidating the author's positions in the current research to enhance his reflexivity (Horsburgh, 2003).

As the author, I was in charge of data collection as well as the research's design and analysis. With more than 20 years of experience as a high school biology and science teacher, I have used SM and other multimedia resources in most of my teaching practices, including laboratory exercises with my students. This has provided me with some experience and insight into teaching with new technologies, as well as my thoughts on this research. However, as a foreigner, coming from a developing country, Ghana, which is culturally and geographically different, and technologically less advanced than Estonia; this orientation might influence my judgment positively towards technology integration by helping me notice aspects that Estonians themselves might overlook or take for granted even as researchers. Again, using English language to collect my data was a limitation to my sampling since most teachers speak Estonian. That was not all. The fact that I was a foreigner, a stranger connecting teachers in Zoom for discussion was an uncomfortable experience especially for the participants and this in a way could affect how they performed during the interview. However, my experience as a teacher could influence the interview with participants in one way or the other.

On the one hand, my teaching experience may be a drawback to the research because I was able to form an opinion and have my prejudice about the research before the interviews. This may have a huge effect on the interview as well as the research as a whole. On the other hand, my expertise has proven to be an advantage and a strength to the research. I was able to ask insightful questions and was a good listener. Asking critical questions during the interview, I was able to gain a better understanding of the perspectives of the participants. As a teacher from a similar professional background, I was also able to communicate very well with the participants, motivating them to share their experiences and thoughts about teaching with multimedia technologies. These qualities of the interviewer also made the participants feel at ease. Subsequently, I used my experience and knowledge as a strength to manage my prejudices and reduce any detrimental effect they might have had on the report.

For example, in Study II, the process of recruiting participants was quite slow; perhaps they were apprehensive about discussing their practice with a foreigner, and also in English. As a result, the sample size was small since only few teachers finally agreed to participate. Except for one, all of the participants chose an online interview when offered the choice to select the interview mode. Again, this could be related to the discomfort of meeting face-to-face with a foreigner who does not speak Estonian. During the interview, I noted that participants were uneasy at times, presumably for the same reason mentioned above. However, recognizing that this could be a constraint that needed to be managed, I maintained my cool by speaking clearly and sharing some of my teaching experiences at some point, which helped participants relax and talk. Again, because of my teaching background, I was careful not to seem overconfident, especially during the probes and follow-up questions. Because this could undermine the conversation's confidence and spirit. This also put me in an awkward position, but as the researcher, I must maintain my professional demeanor. This may have had an effect on my data collection, either directly or indirectly, but it was considered one of the study's limitations. However, the fact that I knew and anticipated that such a circumstance is possible helped me to successfully navigate it.

In the case of Study IV, the recruitment procedure was a little fast, and more teachers wanted to participate except for the English language. In contrast to Study II, the participants had no option because it occurred during the COVID-19 lockdown. As a result, all of the interviews took place in Zoom. When I asked them to demonstrate how they prepare their lessons and teach, they were hesitant once more. They claim that they are not permitted to display their educational resources. Others, however, did. Here, I noted that the teachers were hesitant to show off their resources to a foreigner. Although this might not have any significant effect on data gathering, it was imperative that I anticipated and proactively managed it. Thus, considered it a limitation to the study. Ultimately, being aware of these constraints as a researcher helps in proactively navigating the problems that arise during data collection in order to prevent having any significant impact on the study.

4. FINDINGS

Study I

In **Study I**, a systematic literature review of published studies on how teachers and students use SM was conducted. A total of ten (10) articles were selected from EBSCOhost's database.

4.1. The Approaches by Which Teachers and Students Use Social Media

Studies have shown that SM can be used to improve teaching and learning. However, the absence of direction in students' responsible utilization of SM either for entertainment or learning has brought about the current circumstance where SM is considerably used for entertainment than learning. Consequently, the objective of this study was to review studies on SM as a pedagogical resource for teaching and learning in secondary schools, followed by a discussion of scenarios for using social media in learning in various subjects.

As part of the thesis, the author sought to answer the following research question: "What are the approaches by which high school teachers and students use social media?" The primary objective was to understand how teachers and students use SM in learning. Analysis of data from reviewed articles revealed different approaches by which teachers and students use SM in teaching and learning (see Table 4).

Table 4. How Teachers and Students Use SM

Approaches of SM use	How teachers use SM	How students use SM
Collaboration	Teachers with students brainstorm for solutions to issues with teaching via online chat	Students use group chat and discussion portals to work together on a task or topic.
Communication	Teacher gives updates on tasks, resources, etc. to students	Students share ideas in online chat portals
Interaction	Teacher guides students to reflect and develop on the social skills acquired in SM	Students contribute in planning by giving feedback, asking clarifying questions and making recommendations in SM
Information dissemination	Teacher provides in SM a plan for studies	Students share resources through links, chats, voicemail

Approaches of SM use	How teachers use SM	How students use SM
Entertainment	No approach identified	Students use emoji and short codes to give feedback and guidance to their peers in in fast, funny, and entertaining format
Teaching, Learning and Resource sharing	Teacher plans specific learning activities and creates learning materials that could be used or shared in SM	Students share their own additional learning resources found on the Internet
Socialization	No approach identified	Students learn to work together with members of groups and networks

Types of Approaches

Seven approaches emerged from the analysis of **Study I** that demonstrate how teachers and students use SM in the context of teaching and learning. These are (i) collaboration; (ii) communication; (iii) interaction; (iv) information dissemination; (v) entertainment; (vi) teaching, learning, and resource sharing; and (vii) socialization.

Collaboration – the experience of working together with another human to accomplish a task or achieve a goal (Kwiek, 2020). Five out of the ten papers reviewed cited collaboration as the approach teachers and students adapt to using SM. In order to work progressively and achieve a common goal, the students need collaborative skills. Collaborative skills enable students to work well with their colleagues toward a common goal. Successful collaboration requires cooperative spirit and mutual respect. To attain this skill, the student must be able to communicate clearly, actively listen to other members in the group, respect the diversity of the group, and be responsible for mistakes. On the one hand, inadequate digital resources in the classroom become a limitation to the use of SM for study. On the other hand, that situation becomes an advantage for collaborative work because every student gets access to use the platform when they work in groups.

Communication – an interaction in which information is exchanged in two directions. Communication can be between humans, between humans and computers, or between computers (Cabezas-González et al., 2021; Kotter, 2021). They do it either through text messages, audio or video calls on any SM application platforms of choice, and this was mentioned in nine studies. The findings show that some teachers and their students communicate via SM chat, calls, or videos.

Interaction – this refers to any physical or virtual reciprocal actions or influence without a specific task; this includes verbal/ non-verbal forms, e.g., human-human or human-computer (Heron & Dippold, 2021). In the ten papers

reviewed, interaction was found to be one of the key approaches to effective teaching and learning.

The study discovered that using SM to facilitate student interactions is one of the most powerful ways to get more students involved in the learning process. The interactive affordances of SM encourage students' participation and interest in class or in any group activity. As a result, the study examined SM learning through the prism of social constructivism.

Information dissemination – this is how knowledge in whatever format (e.g., text, images, videos) is transmitted from one person or computer to another person or computer, but the transmission is in one direction (Satija, 2017; Xu et al., 2020). Information dissemination was mentioned in all the reviewed articles (N=10). The findings show that information dissemination is among the three SM approaches consistently used by teachers and students in teaching and learning.

Entertainment is defined as any physical or virtual actions or influence with or without a task that capture one's interest (Bielo, 2018; Fahr & Früh, 2021). Entertainment was mentioned only once throughout the reviewed papers, indicating that it was the least among the preferred approaches by which teachers and students use SM.

Teaching, learning, and resource sharing – acquisition of knowledge through teaching, sharing of learning resources like books, maps, videos, photos and posters, and trending news (Cavus et al., 2021; Wang et al., 2021). Four out of the ten articles reviewed mentioned teaching, learning and resource sharing as one of the approaches by which teachers and students use SM. The findings also showed that there were only a few subject-specific exceptions, such as writing and arts. This means that SM use was basically to develop competencies in social skills because those skills were mentioned in all the papers. Although social skills are considered very important in the 21st century, it seems that the subject-specific potential of using SM has been underused, and this might be a reason why there is a wide gap between usage of SM in learning and everyday life. A solution to support the effective use of SM in learning might be to provide scenarios that combine the development of social skills with acquiring subject-specific outcomes (see Appendix B.1).

Socialization – the process of building social networks for different purposes while mixing socially with others by learning the norms, values, and behavior (LeBaron, 2021; Salisu et al., 2019; Woodrow & Guest, 2017). SM is a key socializing influence among other major agents of socialization. Increasing pervasive information and communication technologies play a crucial role in the socialization process. Results show that 3 studies mentioned socialization as one of the approaches by which teachers and students use SM. Again, it does not support literature that claims that SM use by students and, of course, teachers is mainly for socialization (Ndaku, 2013). This could be because stakeholders perceive SM from the perspectives of its generic socialization affordances (Ndaku, 2013.) without zooming into its specifics. Also, the mindset of using SM for online chatting and making friends, among others, which is how it was designed, has compelled some teachers and educational stakeholders to see it as a tool for social

skills development as opposed to its use as a pedagogical resource; hence teachers lacking the ability to use SM in the context of teaching and learning. Regardless, socialization is rooted in relationship which is fundamental to teaching and learning. Fact is, through relationship, hidden affordances are discovered (Gibson, 1979). As Polanyi (1964) puts it, to use a tool effectively, one needs to dwell in the tool. Indwelling comes by personal engagement with the tool and this hinges on relationship. According to Polanyi, *indwelling* makes the tool becomes like the user's cognition. Thus, *indwelling* enhances the development of tacit skills like insights, competence, experience, confidence, control, and many others. Also, Vygotsky (1978) admits that learning is by social interaction with MKO. Here, MKO could be a teacher or a more knowledgeable colleague who scaffolds the learner to attain his/her maximum potential. Scaffolds could be books, artifacts or technology like SM. Again according to Vygotsky, teaching could be effective if models/ artifacts are often used. In this case, SM could be used to model the Solar System in a Physics class. Streaming an interactive video on Solar System topic in a class could bring teaching and learning into context. Hence, learning the affordances of the environment becomes an important part of socialization.

The concept outlined in Appendix B.1 is a scenario for learning with SM and this could be applied in a variety of teaching and learning frameworks, as exemplified in a learning process phase framework (Otchie & Pedaste, 2020). Thus, the pre-interaction processes, interaction processes and post-interaction processes are the three steps of learning in this scenario. Teachers' roles in pre-interaction processes are primarily to prepare teaching and learning resources to be shared with students and to communicate information to students. Simultaneously, students should play a part in the preparation of the learning process – they should define their own learning goals and prepare for collaborative learning in SM, as suggested by Bandura (1977), and provide comments and suggestions for the teacher's plans so that learning is based on existing knowledge and abilities. Later, during the interaction processes, the most important phase of learning, students not only learn from various resources but also share information about new resources they have discovered on the internet, communicate with one another, collaborate on tasks, and interact with both their peers and computer-based tasks. Similarly, SM can be used for classroom administration or activity management, which is made possible via communication, collaboration, and interaction.

However, social dynamics play an important role here: students form communities and networks learn from one another and provide not only academic but also enjoyable feedback, such as likes or badges on SM. Finally, the post-interaction phase of learning is facilitated by SM. Here, SM serves as a repository of all activities, allowing students to readily reflect on their own or group-level subject-specific knowledge and skills, as well as social skills, with the help of the teacher or peer students. The affordances of SM could be used to assess students in a variety of ways. To summarize, the SM tools and the SM ecosystem as a whole can be used in a variety of ways for learning.

4.2. An Investigation into How Teachers Teach With Social Media

Study II

Following the findings in **Study I**, the investigation moved a step further to inquire into why teachers and students use SM more for social skills development (interaction, communication and information dissemination) and relatively less for teaching and learning subject-specific lessons. In essence, **Study II** aimed to get teachers' perspectives on teaching with SM; also, it focused on how they use SM in the context of their teaching activities. Thus, Study II was meant to investigate how teachers teach with SM and to further use practical instances to illustrate the distinction between the operational (technical) use and contextual use of SM in education.

So, the study explored how teachers use their experiences with SM in terms of its perceived pedagogical use within the context of teaching in high schools. This was done by conducting an in-depth interview with participating teachers in order for them to describe how they operationally use SM, how they use it pedagogically and what their perspectives and challenges are, if any. Then, the results were categorized into four thematic areas to address the research questions in the study.

Teachers' Operational and Contextual Use of SM in the Classroom

Here, the technology used by teachers was categorized into operational and contextual levels. Table 5 provides an overview of some findings in terms of how teachers operationalize and contextualize SM in their teaching.

For instance, at the operational level, teachers use SM as a tool to communicate, share information, post or review content, make friends, or watch trending news, among others. It also allows teachers to edit text and share images, videos, and blogs, among other things. As teachers attempt to gain control of technology use in their teaching activities, they learn more about its operations. In this case, the teacher's emphasis is on acquiring the operational skills and competencies that will enable him/her to use the technology as it was designed. This makes SM perceived primarily as a tool for linking students and exchanging learning resources in a more convenient and straightforward manner. According to one teacher, "any activity with Facebook can be easily saved and downloaded or shared and it is visible to the members of the group … and it is all in the same place, secured, available, and accessible to all the students."

Table 5. SM Technology in the Classroom

Category	Sub-Category	Result	Extracts
SM technology in the classroom	Operational level	Storage, sharing and retrieval of materials	*Any activity with Facebook can be easily saved, downloaded or shared and it is visible for the members of the group …, and it is all in the same place* (Jane)
		Information	*Students can search for information with YouTube so quickly to do their assignments* (Triin) *I also use Google Classroom to give links and other resources to my students to use in their work* (Evelin)
		Access	*One good thing about SM is that the student always has access to lessons materials later or if students forget something at home, they can use the links and download it from the Google Classroom* (Gerli)
	Contextual level	Interactive learning	*My students watch a YouTube video to see how the bonds in the double helical structure of DNA are formed … very interactive, interesting, and revealing* (Kaja)
			I select for example a short YouTube video on the Solar System during a Physics lesson which the students observe how the planets revolve around the Sun … and then they answer some questions in their workbooks (Kristjan)
			The students watch YouTube video during a lesson to hear how some scientific words in Biology are correctly pronounced (Triin)
			I like to use more of SM apps e.g. Twitter as a class account so that we can learn as a class of how we can convey information, who we make it visible to and how we make sure it's credible (Zara)
		Information	*My students take pictures of frogs with Instagram to show information in class about the physical features of frogs in a Biology lesson (*Zara)

Using SM in this context does not provide any pedagogical meaning because these affordances were the objectives for which SM was designed. Thus perceptible affordances. So, at the operational level, it was found that SM used by teachers was just in tune with the intent and purpose of the designers and developers and these functionalities (operational affordances) already exist with the application. Of course, the same approach of SM use as design could be applied in banking, health, trade, and governance. Nonetheless, most of the teachers find SM as a tool that affords them to approach teaching from a student-centered perspective, where they deliver lessons using interactive videos through a collaborative and active learning approach (Otchie et al., 2020; 2021)

So, to be able to use SM pedagogically (e.g. at the contextual level), teachers must transition the operational barrier. Thus, they must apply innovation, experience and skill to bear on teaching with technology. On the other hand, using technology in the context of teaching requires more than just technical competence. Here is what one teacher said when asked about how he/she teaches with SM: "I select, for example, a short YouTube video on the Solar System during a Physics lesson in which the students observe an interactive 3-D model to see how the planets revolve around the Sun … and then the students answer some questions in their workbooks." In this case, the teacher applied knowledge, skill and experience to prepare and present a lesson using YouTube environment. This latter case gives a vivid demonstration of the contextual use of digital resources in teaching.

However, unlike operational use, there is no clarity on how a teacher transitions into acquiring contextual skills and competencies in a tool. This type of tacit knowledge, which is experiential and skill-driven, could perhaps give us a clue (Polanyi, 1962). So, it is important to mention that using the operational affordances of a tool to teach basically cannot produce any effective pedagogical outcome.

Eventually, participating teachers' pedagogical use of SM has shown a level of control and confidence with the technology as a result of their relationship. Therefore, it is important that teachers continually and periodically update their knowledge on the operational and pedagogical application of these tools in order to be abreast with their affordances.

Positively Perceived Pedagogical Affordances

The study organized positively perceived pedagogical affordances (PPPA) of teaching using SM into sub-categories such as resource management, flexibility to learn, learner involvement, and resource availability (see Table 6).

For example, when students view a YouTube video about the marine ecosystem, they can see 3-D pictures of the marine flora and fauna and have a better understanding of how this ecosystem works. Students can interact with this graphic images to have a better understanding of and appreciation for life beneath the waves. Indeed, without modern technology, none of this would be feasible.

Despite the fact that some of the sights were terrifying, the pupils were inspired to learn more and develop the interest in nature. This was an excellent example of contextual pedagogy in action. According to one participant, "some students use SM to contact me and ask more questions to understand a concept or share an idea on a topic."

Table 6. Positively Perceived Pedagogical Affordances

Category	**Sub-Category**	**Result**	**Extracts**
Positive perceived pedagogical affordances	Flexibility to learn	Availability of teaching notes	*"...when a student misses my lesson or cannot understand, he can go to check at home or read what others have done and do it later"* (Kristjan).
	Commu-nication	Online discussion	*".... some students use SM to contact me and ask more questions to understand a concept or share idea on a topic"* (Katarina).
	Interaction	More student activity	*"...the fact that more students contribute in the lesson"* (Triin).
	Availability of resources	Access and variety of learning materials	"*There are many good YouTube videos on Math and English*" (Evelin).
	Sharing of T/L resources	Current learning resources	*"...you can use the latest materials. So today instead of a textbook, I would look at the Notre Dame fire because it happened yesterday"* (Aivi).

In this case, technology is used with greater purpose and context. As a result, learning becomes less difficult. Again, SM promotes learning flexibility by allowing students to access course materials at any time. Another teacher expressed himself as follows: "when a student misses my lesson or cannot understand, he can go to our class LMS portal and read what others have done and do it later."

There are unique and clear affordances that are linked to attaining a successful pedagogical result. One of the highlights is making studying less stressful and more exciting by providing instant access to knowledge and immersive learning possibilities. Learning with SM is also innovative and diverse since it provides a number of learning options and chances outside of the traditional classroom setting, such as remote collaboration and communication via collaborative informal learning protocols.

Negatively Perceived Pedagogical Affordances

Negatively Perceived Pedagogical Affordance(NPPA) in this context refers to using SM purposefully but not pedagogically. Thus, the choice to use SM for anything other than learning or teaching within the educational context (see Table 7). There are websites or apps that may benefit the user but could be counter-productive in terms of teaching and learning. These sites are referred to as NPPA because they do not provide any positive and beneficial learning outcome. Some websites that students visit while in class, for example, can draw their focus away from the lesson. While visiting such sites may temporarily satisfy a student's curiosity, they are considered distracting in a pedagogical sense, as they are unrelated to the class subject.

Table 7. Negative perceived pedagogical affordances

Category	**Sub-Category**	**Result**	**Extracts**
Negative perceived pedagogical affordances	Students' concentration	Distraction by Adverts and messages	"*So, if you set them a task, they wander off to some other page or get this practice by a message coming from somebody else*". (Katarina).
			"*Sometimes students get carried away when using SM …they sometimes look at the pages they're not supposed to*". (Gerli).
	Time management	Time overlap	*"Using FB class group, it looks like my work time and free time is mixed".* (Mirjam).
		Information choice	*"Sometimes I get carried away when preparing the lesson because I have difficulty in managing a lot of information".* (Evelin).
	Students' conduct	Cyber-bullying	*"One negative thing is internet bullying …. what is going on I cannot see if I sit in the classroom".* (Kristjan).

For example, suppose a student chooses to watch a basketball game during a class period. Although he or she enjoys it, the ultimate goal is to miss the academic debates in class, the consequence of doing other stuff in class. Moreover, the negative impact of these pedagogical affordances is not limited to students. Teachers are also concerned because they are still having difficulty with knowledge and time management: for example, teachers must be able to select relevant videos and other multimedia resources for a class within a specific time frame. According to one participant: "Sometimes I get carried away when preparing the lesson

because I have difficulty in managing a lot of information." This is noteworthy since the teacher's negative affordances were caused by the technology's contextualization rather than the technology itself. As a result, teachers must be on the lookout for negative affordances during the contextualization of SM in order to avoid them from manifesting.

Institutional Support

The study investigates how educational institutions contribute to the use of SM and other interactive digital environments in teaching and learning. Institutional support for the adoption of SM in schools includes infrastructural development and personnel training (see table 8).

From the results of **Study II**, it was discovered that all the schools in which the participants taught had the required technology infrastructure and resources for professional development. However, teachers' professional development in the area of technology use was limited. That is, the training was mostly focused on the operational use of technology. As a result, teachers had no prior experience, competence or expertise to effectively teach with technology. So, for teachers to effectively teach with technology, it is important that they rely not only on their knowledge in technology but, most importantly, on their experiences and encounters with the technology.

Table 8. Institutional support

Category	**Sub-Category**		**Extracts**
Institutional support	Infra-structural development	Provided resources	*"Every teacher has access to a separate computer, and we have tablets and laptops for students"* (Kristjan).
			"*Management is very fond of people(teachers) bringing in technology to classes so they're encouraging any use of it (social media)*". (Kaja).
			"All students have computers…and assigned laptops in class. The school also supports BYOD" (Mirjam).
	Staff development	Provided training	*"A regular training on how to teach with technology is provided and we find it very useful"* (Kristjan).
		ICT workshops	"*The school supports teachers to participate in ICT workshops in Estonia"* (Evelin).

4.3. Determining how to Conceptualize the use of Social Media in Education

Study III

Study III explored how high school teachers effectively use SM by reviewing the concept of affordances. Besides, the study provided a framework for contextualizing SM for teaching and learning. Indeed, technology devices, like any other tools, give us a variety of affordances through which we might see the resources in the world (Heidegger, 1977; 2004). Affordances in any tool are open, polysemic and diverse to provide us with a variety of perspectives and creative approaches to achieving our objectives.

Gibson coined the term *affordance* in the subject of ecological psychology, defining it succinctly as "what things furnish, for good or ill…" (Gibson, 1966, p.127). As a result, affordance as a concept can be found in a variety of topics (Davis & Chouinard, 2016; Evans et al., 2017).

Gibson's definition of affordance was essentially based on perception. The environment, he believes, is made up of perceivable affordances that create *action possibilities*. As a result, affordance is not dependent on the perceiver; rather, it is relational and refers to both the environment and the perceiver. This makes "affordances exist whether they are observed or not, but they must be perceived since they are intrinsically about critical properties (Gibson, 1979).

For example, a computer keyboard, allows for typing whether or not there is text to type. In addition, a cup is a tool that allows you to drink. This flexibility may be observed in the way it was created. As a result, it can carry items, and the handles are meant to do so. We can also afford to crush the cup because it is fragile and made of glass or china. So, in theory, the cup provides affordances for drinking or destruction, and there may be further latent affordances in the same cup. These affordances are the cup's action possibilities, and they point in both directions, as Gibson suggests, "for good or ill." Other latent affordances in a cup, on the other hand, may necessitate more skills, such as utilizing it to measure the volume of liquids, among other things. As a result, the essential ingredient that supports affordances is relationships.

Norman (1988) then applied Gibson's affordances concept to human-computer interactions (HCI) and design research. He suggested a new definition that places a greater emphasis on the concept of perception: Artifact affordances, according to Norman, are both perceived and actual properties. In his view, the term *affordance* refers to the actor's ability to act as mediated by the environment and perceived by the actor (Norman, 1988). According to Norman, affordance is a design feature of an object that suggests how it should be utilized, graphic evidence of its role and use. A chair, for example, provides support and so allows Norman to sit. A chair can be carried as well (*ibid*).

Aside from text typing and computation skills, numerous affordances are open and polysemic when using a computer. Until now, all of these ostensible benefits

remained hidden because the focus was on technical or operational issues. Regardless of varying opinions and perspectives on the definitions, the truth remains that affordances are interactions between animal abilities and environmental characteristics. As a result, affordances are real and perceivable, and they exist regardless of who perceives them. Hence, affordances are not affected by perception (Burlamaqui & Dong, 2015).

As a result of the relational idea of affordances, a framework was proposed to enable teachers to use technology effectively in their instructional activities. The framework is based on dialogue, which is the foundation of any relationship. The framework has three phases that follow each other in clockwise order: the *understanding phase*, the *interaction phase*, and the *contextualization phase* (see Figure 4).

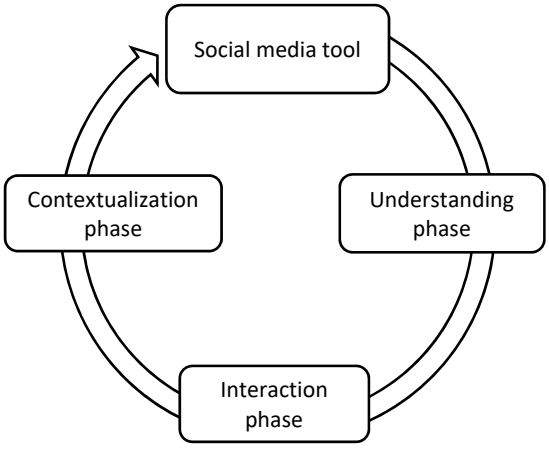

Figure 4. A Framework for Using Social Media

4.3.1. The Understanding Phase

Fundamentally, understanding is the first and equally important step in using SM to its maximum potential. This step entails learning about the concepts and application of using SM – learning about the hardware and software and the concepts underpinning its use entails learning about a wide range of technological gadgets, called hardware. Some examples of the hardware devices are desktops, laptops, smartphones, notebooks, whiteboards, projectors, digital cameras, etc., and the software include applications like Microsoft suite, Google, Firefox OS, Zoom, Skype, Facebook, Outlook, email, antivirus, etc. Also, this phase allows the user to learn how to use the tool as it was designed. Explicit knowledge is required to understand the technology, and this knowledge can be documented and passed down from generation to generation.

The understanding phase, as the name implies, assists the user in understanding the technical functions and operational affordances of SM. Essentially,

this phase enables a teacher, for example, to gain technical and operational skills and knowledge in the field of SM. The user can also learn how to use SM in reality during the understanding phase. Even though knowledge and skills are confined to its stated function, it allows the user to communicate (through voice, text, or video), socialize, connect, and share digital content remotely. However, acquiring technological knowledge only helps one to use the operational features in the tool to facilitate the affordances as designed. This is the phase where users acquire technological knowledge as in the TPACK model. Although this is a significant step, technological knowledge in addition to pedagogy and content knowledge can by no means make teachers effective with technology use.

4.3.2. Interaction Phase

Interaction phase is the second stage of the implementation of the SM framework. By engaging in regular interaction with the technology, the user begins to form a relationship with it. As a user engages with the technology more frequently, he or she tends to uncover new contextual affordances. Although this phase appears to be typically activity-based, it is generally tacit since the information and skills developed during this phase cannot be documented or transferred from person to person (Polanyi, 1964).

During this phase, everything that happens is tacit and represents one's encounter and experience with technology. In essence, a user's constant involvement with any SM app aids the formation of a bond between the two parties. This allows users to uncover a variety of contextual affordances that, while available, look latent when one is supposedly "separated" from technology. This viewpoint supports Gibson's theory that our environment offers a variety of action possibilities and that one's discovery of these possibilities and access to them are largely determined by one's relationship with the environment (Gibson, 1979). For example, a teacher's knowledge of SM will be insufficient for pedagogical activity unless he/she fully understands the technology's behavior. A constant dialogue with SM aids in the discovery of previously undiscovered contextual affordances. This might be accomplished by using SM daily and pushing the capabilities to their limits. As the saying goes, "practice makes perfect," and regular practice with SM removes perceived uncertainty and increases user confidence. Furthermore, it creates a tacit bond between the user and the tool, allowing him or her to understand the tool's capabilities and limitations. A teacher's level of confidence in employing technology in a pedagogical context is critical to successful and effective outcomes.

4.3.3. Contextualization Phase

Contextualization phase is the final and most crucial step of the framework. This phase allows a user to employ SM purposefully to a context. However, to reach this phase, it is necessary to progress steadily through the previous phases, namely the understanding and interaction phases. To achieve the desired result, it is also necessary to integrate the explicit knowledge from the understanding phase with tacit knowledge from the interaction phase. Then SM will apparently become an integral part of the user's body and mind as highlighted by Polanyi (1964). Here, the user's thinking and reflex actions get coordinated through the technology as he/she begins to articulate the technology contextually. At this juncture, for instance, a teacher has a higher level of confidence as he/she engages the tool in a pedagogical activity. This phase could also be likened to a teacher and a chalkboard that appear integrated and synchronized such that any pedagogical tasks can seamlessly be executed without perceived distractions and separation. In essence, this is the phase where, for example, there is a convergence of a teacher's technological knowledge, skills, insights and competencies with pedagogical and content knowledge. Ultimately, it is at this level that teachers can maximize the pedagogical potential of SM and other technologies to produce effective and successful outcomes.

4.4. An Analysis of how Teachers' Contextualize the use of Social Media

Study IV looked at teachers' perceptions of SM usage and their ability to use it in the classroom context. Explicit and implicit (tacit) knowledge aspects were used to contextualize teachers' relationships with SM. The following research questions were formulated:

1. How do teachers contextualize SM in teaching?
2. What are the constraints teachers encounter during teaching with SM?

Following the use of the ethnographic research method and the sampling protocol (purposive, convenient, and snowballing), selected teachers were interviewed and the data analyzed accordingly.

Pedagogical Affordances of Social Media

In the context of teaching with SM, many affordances emerged. During the interview, teachers mentioned a variety of choices and experiences that SM provided them in their teaching. They could select and arrange their students based on their abilities and competencies to cooperatively execute projects while remotely

supervised, in addition to being able to connect with the students remotely. One participant claimed that technology motivated her to do traditional teaching tasks in a virtual context. When she was in quarantine at home, Zoom allowed her to connect with her students on their iPads and teach her classes without being physically at school. The lessons were also recorded, which is a great opportunity for students who have been absent from school to catch up.

The Impact of COVID-19 on Education

The COVID-19 pandemic has accelerated the usage of SM and increased the necessity for it, notably for distant teaching and learning. Individuals, institutions and economies have all suffered serious hardships and disruptions as a result of COVID-19. Across countries, schools were closed, making normal teaching and learning impossible. COVID-19 has caused immeasurable hardships, but it could have been far worse if new technologies like Zoom, Facebook, Twitter, WhatsApp, Google Classroom and YouTube, among other SM platforms, had not been available. This has resulted in recent substantial surges in SM use (Greenhow and Chapman, 2020). Essentially, Study IV was not about what teachers did during the COVID-19 pandemic; yet, given that the interviews were performed during the pandemic, it was inevitable that teachers would bring it up.

One teacher believed the pandemic had made teachers more proactive by requiring them to prepare and store more digital resources. For example, without COVID-19, she would not have been able to create the videos that she did. She believed COVID-19 had made her more technologically proactive and responsible. COVID-19 had shifted the perceptions of another teacher, too. She explained during the interview that now anything was possible. She could now travel and yet connect with her class remotely because of COVID-19.

Another teacher reported that the COVID-19 situation had made her improve her skills and technique in terms of how to deliver synchronous lessons in an online environment. Also, it helped her to pay more attention to time management, such as prepare everything in advance. She believed that the circumstance had also motivated her to improve her YouTube video teaching skills.

Importance of Regular Dialogue With Technology

Others talked about how their earlier experiences with SM had influenced their teaching. According to a physics teacher, his previous skills with SM aided him in selecting appropriate videos that provide various perspectives on the topic. He was also able to provide his students with some really useful resource links.

One teacher described why she preferred Zoom over other related applications. According to her, Zoom has fantastic features that competitors such as Microsoft Teams and Google Meet do not. Zoom allowed her to create a breakout room for her students. It offered her the possibility to group the weaker students with the

outstanding ones, which benefits the students who are struggling. Within the Zoom setting, this teacher relied on peer and collaborative learning. As a result, smart students may help or *scaffold* their less brilliant classmates.

Another teacher claimed that teaching with technology looked easy and interesting because she was using it all the time to deliver her lessons. In her chemistry lessons, for example, YouTube videos enabled her to interactively show the visual and spatial orientation of the structures and processes in atoms, molecules, and compounds. These are abstract topics that students had previously found difficult to visualize in their ordinary classes. After using YouTube videos in her lessons, students became more motivated to learn chemistry because they could now visualize complex concepts.

As one teacher put it, she developed confidence through using technology in her classroom daily. This allowed her to efficiently use the Zoom breakout rooms to assign class assignments to her students. She said that she was able to remotely observe and provide feedback throughout the online teaching and learning activity.

After seeing a remote demonstration of teaching using digital tools, the author learned that teachers used a variety of digital multimedia resources during their teaching activities, such as text, videos, and photos. According to participants, combining various multimedia tools engages students and makes teaching and learning more effective, a conclusion that has been found in many studies (Mayer, 1997; Ni, 2017). During the interview, teachers were asked to demonstrate the types of digital tools they used, how they prepared lessons, and, most importantly, how they used these resources to teach. Screenshots from videos showing how teachers prepare lessons and teach with technology can be seen in Paper V. According to one chemistry teacher, he chose a particular video because it provided a 3D visualization that was more interactive and engaging, allowing students to easily see how chemical bonds are formed as well as to visualize the angles of bond rotation, which could not be possible without the kind of SM interactive technology like YouTube.

Another teacher reported that the LMS he used came along with some learning tools, such as text, photos, videos, and other media. He did, however, mention constantly browsing YouTube for supplemental videos to make the lesson more visual and participatory, which helps to explain abstract concepts in a lesson. He used his pedagogical, content and technological knowledge and experience to do this search (Mishra and Koehler, 2006). These are some examples of teachers attempting to contextualize technology during remote or traditional face-to-face (F2F) classroom teaching.

5. DISCUSSION

5.1. Approaches by Which Teachers and Students Use SM

In **Study I**, the aim was (1) to identify studies that were conducted on SM use in high schools and (2) to find out the approaches teachers and students adopt for using SM.

On the one hand, the findings show that some studies have been conducted in the context of SM use in secondary education, but the number is relatively small compared to studies on SM use in universities and colleges (Otchie & Pedaste, 2020). This supports previous studies that call for more research especially on SM use in the context of secondary education (Abdulqader & Almunsour, 2020; Greenhow & Lewin, 2016). On the other hand, the review identified seven approaches by which teachers and students use SM in learning: collaboration; communication; interaction; information dissemination; entertainment; teaching, learning, and resource sharing; and socialization.

The findings also show that some teachers and their students communicate via SM chat, calls, or videos. This is consistent with a number of observational studies (e.g., Bleakley et al., 2014; Ndaku, 2013), which indicate that most high school students use social media to interact with peers in chat rooms. However, using SM for entertainment such as watching movies and playing video games was mentioned only once throughout all the reviewed papers, indicating that it was the least approach by way teachers and students use SM. This contradicts the previous studies which claimed that students use SM more for entertainment (Ndaku, 2013). On the other hand, this could also confirm previous findings that a relatively few studies were done in high school on this topic (Greenhow & Askari, 2017; Manca & Gleason, 2021).

This degree of youth acceptance of SM is primarily due to the technology's growing accessibility, suitability, flexibility, and ease of use (Al Alwan et al., 2017; Dwivedi et al., 2016). Many academics have proposed and outlined the possible pedagogical benefits as a result of this (Greenhow & Lewin, 2015).

Again, the author noticed that teachers and students used some of these approaches more and more consistently than others. For example, interaction, information dissemination and communication were consistently used in the teaching and learning process by the respondents. Indeed, SM facilitates teaching and learning by disseminating information and facilitating group discussions as a form of communication and interaction (Rodriguez-Hoyos et al., 2015). In essence, a dialogue or interaction is one of the most important techniques to effective teaching and learning (Manca & Ranieri, 2013; Vygotsky, 1978). This reinforces Vygotsky's perspectives on teaching with models to enhance student involvement and the ZPD concept. This supports previous studies that identified the approaches by which teachers and students use SM in teaching and learning (Makri & Schlegelmilch, 2017; Rodriguez-Hoyos et al., 2015). However, TLR, which focuses on subject knowledge development regarding classroom lessons,

is among the least of the approaches used. One reason for not using TLR more often could be that although students and teachers might have social or operational skills for using SM, they lack competencies for its contextual use (e.g., editing of video files, pictures and text). The lack of competence could affect their confidence and motivation to use SM as a pedagogical tool in teaching and learning specific topical lessons. For instance, respiration and photosynthesis in biology, oxidation and chemical reactions in chemistry, or magnetism and mechanics in physics. These lack of competence also directly affect students to work collaboratively on a task.

This means that teachers' ability to contextualize SM in their instructional activities is important to its effectiveness (Aagaard, 2018). As a result, the context in which it is used is decided by the user (Aagaard, 2018; Lanamäki & Stendal, 2015). Here, literature emphasizes the importance of teachers continuing to build their SM capabilities, experiences, and values (Otchie et al., 2021). Critical thinking, problem-solving, and the ability to contextualize SM require intellectual, social, and ethical talents regardless of operational proficiency. Thus, it becomes imperative for teachers to build relationships with technologies to understand using them in the context of teaching and learning (Oliver, 2016; Stevenson et al., 2019). This could potentially bridge the gap between formal learning and other dimensions of learning. However, teachers' focusing only on the operational use of SM is not pedagogical and therefore cannot produce any significant pedagogical outcomes. Hence, the failure of teachers to contextualize SM in teaching specific topical courses may be the primary reason that it is not being used effectively in secondary education. Indeed, various research on learning using SM show that, despite its perceived shortcomings, it has a lot of potential as an instructional tool (Van Den Beemt et al., 2020; Greenhow & Chapman, 2020). However, utilizing SM for operational goals that focus on social skills (e.g. communication skills, collaborative skills, etc.) rather than contextual usage in topic knowledge capabilities results in a decrease in learning outcomes (Kirschner & Karpinski, 2010; Van Den Beemt et al., 2020).

The fact that less attention is paid to SM use in high schools could also be because SM use in secondary education has not been a primary focus for many researchers. This could be due to stakeholders viewing SM via the lens of its broad socialization affordances (Ndaku, 2013) rather than narrowing in on its peculiarities. Furthermore, the mindset of utilizing SM for online chatting and meeting friends, among other things, has driven some teachers and educational stakeholders to regard it as a tool for social skills development rather than a teaching resource. Here are a few thoughts shared by participants on the potential dangers of SM in the classroom. According to one teacher: *So, if you set them (students) a task, they wander off to some other sites or get this practice by a message coming from somebody else...* Then the second teacher remarked*: One negative thing is internet bullying …. what is going on I cannot see if I sit in the classroom… (Otchie et al., 2021).*

Thus, using SM mostly for socialization and entertainment could also be one of the reasons why SM use has been prohibited in some schools. However, there

could be other reasons: for example, in the United States, the use of SM in schools has frequently been banned due to recurrent instances of cyberbullying and other anti-social behaviors that it allows (Peterson & Densley, 2017; Waters et al., 2020). This could also be one of the reasons why the search conducted in the EBSCOhost database on SM use in high schools yielded few articles. Also, it could explain, among other things, why many teachers do not see the value of using SM to teach academic lessons. As a result, a paradigm shift from this way of thinking could open the way for the integration of SM into school teaching and learning. Finally, there is a strong reason to build social skills (Manca & Ranieri, 2013), but not at the expense of subject-specific knowledge, which is equally important to core competencies (see European Commission, 2017). This study, on the other hand, highlights the question of how SM is employed in teaching and learning. Thus, the study's findings enhance current research by identifying and emphasizing the dominant approaches of SM use in learning by teachers and students.

Based on the findings and discussions, it becomes important that any approach to integrating SM into learning should consider combining both social skills and subject-specific goals. As a result, SM could be used to enhance formal learning activities through the use of methodologies such as blended learning, flipped classrooms, and ubiquitous learning (Otchie et al., 2020). The study also recommends that teachers should interact with SM more regularly, utilizing it more pedagogically to help them develop their skills and confidence (Otchie et al., 2020).

Thus, combining these approaches could lead to more widespread and effective use of SM in learning, as the research indicated that studies have predominantly focused on either of these properties. On the one hand, Study I demonstrates how to design a teaching and learning scenario **(**See Appendix B.1**)** by outlining the stages of the learning process (Otchie & Pedaste, 2020). This framework, on the other hand, can be utilized to maximize teaching using SM in a variety of learning processes and settings.

5.2. Operational vs Contextual Use of Social Media

Study II was designed to highlight and proffer a solution to the contrast between the *operational* and *contextual uses* of SM in teaching.

As a first step, it is important to differentiate between operational and contextual use by reviewing teachers' use of technology in order to resolve the ambiguity surrounding the use of SM in education.

At the *operational* level, for instance, SM has been predefined, so a teacher can decide what to do with it depending on its functionalities and limitations. Some teachers regard SM as a tool that allows them to obtain and share learning resources with their students, according to the research (Elkaseh et al., 2016). So, at the operational level, SM was used exactly as the software designers intended, and hence, the operational affordances (functionalities) were already present in

the technology (Angeli & Valanides, 2018). Teachers are, however, attempting to gain control of its functions and build a fundamental link with its operations. Among other things, it allows teachers to update text and exchange images, videos, and blogs. As a result, a few teachers' comments indicate that SM appears to be primarily a tool for connecting students and exchanging learning resources easily and seamlessly. However, most teachers see SM as a tool that allows them to teach from a student-centered perspective, employing interactive YouTube videos and a collaborative and active learning method to deliver lessons. This backs up research that sees SM as a dynamic, student-centered platform (Manca & Ranieri, 2013; Siemens & Weller, 2011; Vygotsky, 1978).

At the *contextual* level, however, use of technology is flexible and dependent on the user's interaction with the technology and environments. As a result, the user is in charge of determining when and how to use the technology, which goes beyond its operational limitations. To be able to discover these pedagogical affordances, a teacher must *dwell in* the technology to contextualize it pedagogically (Polanyi, 1962).

Perceptions underpin affordances (Gibson, 1979). Perceptions are dynamic processes that afford, for example, teachers to try new things, explore evolving technology, test new concepts, and build new strategies and ways to handle developing challenges (Hamilton, Rosenberg, & Akcaogluet, 2016; McKenney & Roblin, 2018). As a result, the decisions we make are a mirror of our environmental experiences (Kopcha et al., 2020). This confirms Gibson's affordance concept, which holds that our thoughts and reactions are a reflection of our interactions with people and objects in our environment.

In other words, a teacher's experience with technology may have an impact on his/her perceptions (Kopcha et al., 2020). This indicates that a positive interaction with technology by a teacher could lead to a positive experience and positive perceptions, which could lead to more meaningful usage of technology in the classroom. To gain experience, a teacher must create a relationship with technology which ultimately allows him/her to dwell in the tool. As a result, the technology becomes deep-rooted in their minds, allowing them to recognize the majority of the educational benefits and contextualize its use. This could help to maximize the use of SM in the classroom while also minimizing the perceived risks.

However, unlike operational use, there is no clear guidance on how a teacher moves from operational to contextual skills and competences in a tool. The author could then argue, following Polanyi (1962), that the process of acquiring such skills and competences is rooted in the development of tacit knowledge, which is personal and experiential. As a result, contextual affordance is defined by a degree of openness that allows users to choose the context. This means that the contextual use becomes more uncertain, unstructured and tacit because it might go either way, for good or ill, as referenced to Gibson (1978).

Hence, affordances refer to the act of thinking creatively about how to adapt a tool's operational affordances into pedagogical (contextual) affordances to

achieve a purpose. To establish a pedagogical impact, it is critical to be innovative in blending operational skills with experience.

Therefore, teachers require greater hands-on experience and tacit knowledge-based skills. This was also revealed in the interviews, where teachers described how their SM experience and operational abilities helped them prepare and present lessons effectively with SM. The participating teachers' pedagogical use of SM finally displayed a degree of control and confidence with tools as a result of their constant communication with the tools. This backs Polanyi and Gibson's claims regarding the relevance of tool relationships. The concept *operational and contextual affordances* was introduced as a first step in understanding the complexities of properly using technology. Also, the concept exposes the limitations in Mishra and Koehler's (2006) TPACK model, which claims that effective teaching with technology is dependent only on teachers' technological knowledge, pedagogical knowledge, and content knowledge.

In terms of perceived pedagogical benefits, technology allows students to communicate with their lecturers at any time. It also provides quick access to teaching and learning tools for both students and teachers. Meanwhile, pedagogical affordances may alternatively be viewed as negative because students may become distracted and visit sites that are unrelated to the learning context. Although playing games, watching movies, etc., is beneficial to the learner, however, the context made it a distraction. As a result, this becomes a negative pedagogical affordance.

These two examples show two different ways of using the same tool in the context of teaching and learning. On the one hand, even though the use was advantageous to the learner, the context caused it to be regarded as a distraction. Indeed, the student may have used it in a meaningful and pedagogically relevant context. It is also worth noting that the student's apparent misuse of the instrument, which was labelled "negative affordances," was a product of his or her connection with technology. In other cases, however, using technology to access online learning resources is beneficial to the user. As a result, it was referred to as "positive affordances". This indicates that the user bears the burden of contextualizing technology because he or she decides the context of use.

Meanwhile, all the participants commended the technological support and infrastructure provided by their schools. This was in contrast to previous study, which claimed that schools lacked technology infrastructure and support (Taghizadeh & Hasani Yourdshahi, 2020). According to participants, all teachers receive computer technology training regularly at their schools and attend workshops held in Estonia. However, it was discovered from the interviews that most training courses focused more on the operational level than the pedagogical level, causing teachers to be more operational rather than pedagogically inclined in their use of technology. However, the results show that a small percentage of students did not have regular internet connection or personal computers at home, confirming Rasheed and colleagues' (2020) findings that pupils have unequal access to technical support and resources. Meanwhile, the integration of SM into the curriculum will facilitate teaching and learning (Moghavvemi et al., 2018; Otchie

et al., 2020; 2021). This resonates with the opinions and perspectives of Chugh and Ruhi (2018), Parusheva and colleagues (2018) and Al-Qaysi and colleagues (2020). As teaching will be more interactive and engaging because videos will be used more for lessons in the classroom. This will of course demonstrate real-world scenarios taking away the abstraction which is currently the case as mentioned by Rosin and colleagues (2021). What is more, teachers will discover more affordances and resources to teach as they dialogue with technology. Ultimately, the focus will be shifted to the teaching and learning process and not the technology as is currently the situation (Otchie et al., 2021).

5.3. Theorizing Affordances Concepts

Study III focuses on the affordance concept in terms of how the teacher perceives technology tools within the context of educational technology. These technologies facilitate active and interactive learning and can be used as teaching and learning tools (Greenhow & Chapman, 2020; Manca et al., 2015). Teachers benefit from the affordances of digital technologies in many ways, including collaboration with colleagues from other schools (Carpenter & Green, 2017). In the narrative, the concept of affordances has been used in the most visible attempts to theorize technology (Oliver, 2013). In essence, the study looks at the teacher's ability to teach effectively while utilizing the pedagogical affordance of technology. Understanding the concept of affordances is the first step to support teachers learn to use technology regularly to enable them discover more implicit (hidden) affordances in the technology. Aside discovering more affordances, regular dialogue (interaction) with technology affords teachers the opportunity to develop confidence and gain control in contextualizing technology in the classroom. In a study, Thill and colleagues (2013) observed that, objects often elicit several affordances. For example, tools are manipulable things that evoke a variety of affordances. They trigger not only grasping affordances, but also those linked to their function (Thill et al., 2013).

For instance, on the one hand, a pencil is seen as nothing more than a bit of wood. On the other hand, a pencil is seen by an adult as a tool that allows for writing, but not by a child or a dog (Aagaard, 2018).

That said, Gibson's ecological concept of affordance was fundamentally relational and heavily reliant on perception. However, in the interpretation of affordances, the author supports Aagaard's position that affordances tend to encourage certain activities rather than a wide range of options, and this notion aligns with our experience with the use of digital technology in schools (Aagaard, 2018). Although the affordance idea is based on perception, it aids in conceptualizing the relationship between tools and the environment as well as how this translates to the use of digital technologies in the classroom.

Similar to Gibson's affordances, Polanyi sees human interaction with tools as being reliant on relationships. However, Polanyi views knowledge as a critical component of this relationship. The concept of indwelling by Polanyi is an

intuitive phenomenon in which a person's relationship with a tool allows them to contextualize it for meaningful use. Knowledge, according to Polanyi, influences a person's ability to dwell in tools. He classifies knowledge into two categories: impersonal (explicit) and personal (tacit).

The most important lesson learn from Polanyi is that once a tool is in use, it is never external to the user. This indicates that the tool is no longer treated as a separate entity (Polanyi, 1962). Polanyi uses the example of a probe or a stick to demonstrate this concept. When we start using it, Polanyi writes that "the sensation of the probe pressing on fingers and palms, and of the muscles guiding the probe, is lost, and, instead, we feel the point of the probe as it touches an object" (Polanyi, 1966, p. 13).

Building on Polanyi's insights, tools become extensions of our cognition when we gain control over their operational affordances. Following Polanyi's logic, the author might claim that the degree of our relationship with SM, or any instrument, is exactly proportionate to the variety of affordances discovered. Regular dialogue with digital tools will now help us improve our relationship with the way and manner in which we utilize these digital technologies (Gibson, 1979). This enables the user to discover the tool's various affordances. This also implies that until a user identifies the context of use, any tool stays neutral. A Facebook interface, for example, remains neutral until someone decides to post or share some text or images. This means that contextualizing a tool has nothing to do with the tool and everything to do with the user and the context (Gibson, 1979); and this can manifest itself in a variety of ways, such as the potential abuse of technology tools (e.g., social media) and the resulting psychological ramifications, despite their touted affordances (Coyne et al., 2019).

This affordance concept, on the other hand, has shifted the emphasis to the purposeful use of technology in education. In education, educational technology is used for more than just obtaining information. It provides an immersive environment as well as cognitive tools to assist learners in discovering new learning possibilities and finding solutions to their questions (Januszewski & Molenda, 2008). These cannot be attained by mastering the technology's operational or technical functions or by comprehending its cognitive process. It is more than that. Human learning requires an understanding of feelings, motivations, and values. Without motivation and ideals, a teacher's ability to "dwell in the tool" and make it an extension of his or her cognition is impossible.

So, to highlight the importance of relationship as a crucial component of effective technology use in the classroom, a conceptual framework that includes visual cues and concepts was proposed that will assist teachers in understanding the processes and intricacies of contextualizing technology pedagogically (see Figure 5)

Vygotsky's social constructivism, Gibson's affordance, and Polanyi's indwelling concepts serve as the foundation for this framework. It consists of three competency phases for using SM in any setting: These phases are understanding, interaction, and contextualization.

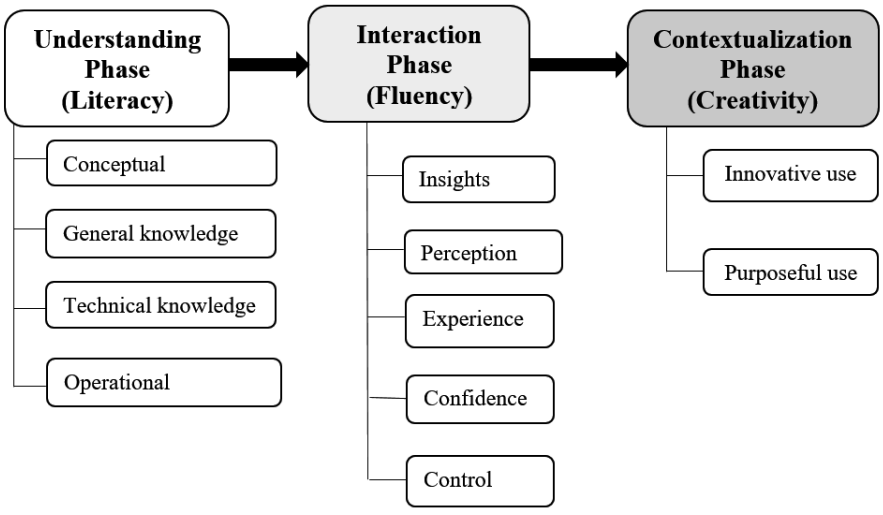

Figure 5. Conceptual Framework for social media use

The *understanding phase* is distinguished by explicit, pragmatic, and externalized information that may be documented or communicated (Polanyi, 1964). There are four (4) knowledge dimensions in it: conceptual knowledge, general knowledge, technical knowledge, and operational knowledge. Conceptual knowledge is concerned with ideological and pragmatic viewpoints on technology. Essentially, this level of knowledge serves as a lens through which to have a worldview about digital technology. Also, these knowledge dimensions can be viewed from the social and active learning concepts, social constructivism, where learners have the space to construct knowledge by social interactions with more knowledgeable others (MKO), or books, artifacts, technology(SM), etc. through scaffolding (Vygotsky, 1978). Again this phase can basically be described as the literacy phase.

The *interaction phase* is distinguished by an implicit or tacit knowledge dimension. Tacit knowledge is mostly internalized and cannot be documented or passed down from one person to the next. This phase's characteristics make it a key knowledge dimension, however it appears that it is missed, disregarded, or ignored when it comes to utilizing technology. Five dimensions of tacit knowledge are described here: insights, perception, experience, confidence, and control. These knowledge dimensions can only be obtained by direct experience. Hence, through regular practice and consistent dialogue with the technology this knowledge can be acquired. This explains Polanyi's concept of *indwelling*, in which one literally dwells in the tool, synchronizing cognition with the tool. In other words, regular interactions actually move the tool into the user's side, resulting in no separation (Heidegger, 1927). Furthermore, it is via regular interaction that the user learns confidence, competence, and expertise, and finally gains control of the technology. As a result, our interactions with the environment allow us to find various action possibilities (Gibson, 1979). Hence, this phase can also be

referred to as the fluency phase where users gain mastery and are in control of the tool.

The *contextualization phase*, on the other hand, entails a deliberate and value-added use of technology. At this stage, users apply creativity and innovation to using technology in context. This phase depicts the actual and perceived interaction between explicit and tacit knowledge components. In this stage, the user synchronizes both practical and experiential knowledge gained from the technology, maximizing its potential while minimizing any risks. Finally, the theory demonstrates that teaching with SM or any digital tool can only be effective if both explicit and tacit knowledge dimensions are taken into account.

5.4. Pedagogical Use of Social Media

Through the perspectives of operational and contextual affordances, **Study IV** sought to understand how teachers articulate SM in the context of teaching and learning. This was done by analyzing the data using emerging affordances in teaching with SM.

The interview I had with teachers revealed that they (teachers) had extensive knowledge and abilities in the use of digital technology but had no understanding of the concepts of operational and conceptual affordances that was discussed. Their description of the methods and protocols for employing SM in teaching and learning, on the other hand, was based on the aforementioned concepts. However, their use of technology in the classroom was purely operational, such as handing out assignments, offering feedback, and providing access to resources. They unintentionally contextualized SM at times, particularly during lesson preparation, presentation, and organizing class activities around a subject lesson. In the author's view, understanding this affordance concept can help teachers effectively teach with technology.

Indeed, the interview with teachers exposed different perspectives about their encounters with SM in the context of teaching. The findings support and contribute to previous studies on SM affordances (Gibson, 1979; Norman, 1988), where many teachers shared some insights and perspectives on teaching with SM. For example, all participants attributed their fluency and competence in digital tools in the context of teaching to regular use. This practice, in a way, enabled them to perceive or even discover more affordances for using technology in the context of their work.

As a result, these benefits enabled them to perform things that were previously impossible in typical classrooms. The benefit of being able to use SM to demonstrate 3D visual orientation of abstract concepts in lessons, for example, cannot be underestimated. As a result, 3D images help participants acquire confidence, gain control, and make SM use more seamless. These findings are consistent with Gibson's (1979) relational and perception-based concept of affordance. As a result, our relationships with the environment make it easier for us to discover new affordances or ways to interact with it.

Primarily, the degree of interaction with SM affects the amount of relationship, which has a direct impact on teachers' ability to articulate this tool in their teaching process. As a consequence, the tool's explicit and practical knowledge provides the user with operational or technological affordances. Although this knowledge is essential, it merely assists the user in comprehending the technology's functions, thus, allowing him or her to utilize the tool as intended: to share, post, communicate, watch movies, chat, and so on. However, more than technological expertise is required to articulate technology in a specific context.

A teacher, for example, will be able to effectively teach with technology if he or she has regular interactions with it in addition to pedagogy, content, and technical knowledge (Graziano et al., 2017). This encounter leads to the acquisition of tacit knowledge; which Polanyi refers to as experiential knowledge.

Subsequently, participating teachers were requested to show to the author the digital tools they use, how they prepare their lessons, and how they teach in the digital environment. To make their teaching more interactive and fascinating, teachers relied on resources from their school's LMS as well as carefully selected appropriate YouTube videos. When it came to virtual learning, teachers employed Zoom, Teams, and other related technologies. Most teachers, on the other hand, preferred Zoom for online teaching because it offered more capabilities, such as the ability to remotely arrange students in breakout rooms and oversee them as if they were in a face-to-face situation.

Learning through SM provides the learner with a variety of learning options and preferences as well as the ability to learn remotely from various locations. It allows learners to engage in lifelong learning, professional development, self-regulated learning, informal learning, and formal learning (Otchie et al., 2022; Peters & Romero, 2019).

Therefore, all stakeholders in education must work together to make technology available, accessible and useful at home and school. Users can "interrogate" these tools and become familiar with them as a result of this constant interaction, which improves their abilities and confidence. This behaviour, according to Polanyi, causes the user to act as if he or she is inhabiting the tool.

Finally, the final framework for teaching using SM was proposed (see Figure 5), which emphasizes the importance of relationships as a key component of effective technology use. (Otchie et al., 2022).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The overall purpose of this doctoral thesis was to make teachers aware of the importance of contextualizing SM in their teaching and learning activities. On the one hand, this doctoral thesis aims to help teachers understand and appreciate the importance of regular intraction with technologies to gain control over their operations and uncover new affordances. On the other hand, teachers will be able to appropriate these tools by contextualizing these affordances in their teaching process.

Studies I – IV provided answers to the four research questions in the following ways:

For **study I**, the narrative showed that teachers and students use SM more for social skills development and less for subject-specific learning. This was discovered in the seven approaches by which teachers and students use SM which are (i) collaboration; (ii) communication; (iii) interaction; (iv) information dissemination; (v) entertainment; (vi) teaching, learning, and resource sharing; and (vii) socialization.

Essentially, interaction was one of the key approaches to effective teaching and learning. Hence, the most widely used learning approaches, e.g., student-centered online courses are designed based on a socio-constructivist concept of teaching and learning.

However, teaching, learning and resource sharing (TLR), which focuses on subject knowledge development regarding classroom lessons, was among the least used approaches identified. Although students and teachers might have social or operational skills for using SM, they lack the competences for its contextual use (e.g., editing of video files, audio, text or pictures for content suitability). Lacking the competences to articulate SM contextually could affect their confidence and motivation to use it as a pedagogical tool in teaching and learning.

In **study II**, the perspectives and insights teachers shared with regards to using SM in the classroom compelled the author to disambiguate the term “use of SM”. This resulted in coming out with two concepts: *operational* and *contextual use* of SM respectively. Operational use of SM basically focuses on the knowledge and concepts about the technology, the functions, and how to use it as designed. Thus making operational use pre-defined and not context-specific. What is more, operational use is a form of explicit knowledge. In terms of the contextual use however, the use is open and polysemic. Hence, SM use in a specific context is dependent on the user, the tool as well as the context. Thus making the knowledge

that underpins contextual use more tacit. This creates some uncertainty in terms of use.

So, the findings of the study essentially supported the claim that SM can be used as a pedagogical resource for teaching and learning. Operationally, many teachers use SM because these tools afford them to connect remotely with their students at any time and from anywhere, allowing those who were absent from school to follow along with the teachings from any location. It is also worth noting that these technologies enable teachers to access learning resources and also resources of other colleagues at different institutions remotely. Students' interest in learning has also grown as they have found learning to be more flexible, received prompt feedback and had easy access to teaching and learning resources.

However, unlike in the case of *operational use*, there is no clear guidance on how a teacher moves into developing *contextual* abilities and competences in a tool. This means that understanding how to use technology is only the beginning. Essentially, this entails considering how to change a tool's operational affordances into pedagogical affordances to provide educational meaning and values. As a result, it is critical to note that employing a tool's operational affordances to teach will rarely result in a successful educational outcome.

This means that the ongoing operational use of these technologies by teachers and teachers' inability to articulate their educational application is one of the most significant obstacles that teachers face. Furthermore, the lack of any coherent narrative of technology may offer a significant barrier in the drive for technological integration in education. Because there is no solid data to link technology use and learning, this could be a problem. Having said that, no tool is perfect. As a result, every tool is merely a means to an end. As a consequence, in contextualizing technology for teaching, the teacher's understanding of the technology is a critical step in achieving its intended usage. While operational and conceptual knowledge of technology is crucial, it falls short of defining the technology in a given context. However, this information is insufficient for using the technology pedagogically. Rather, it allows the teacher to use the technology as it was designed.

Study III has contributed to a more in-depth discussion of the perceived pedagogical potentials of technological tools. As a result, visual cues were provided with a framework to teachers to assist them to contextualizing technology within the teaching process (see Figure 5). It has also highlighted the importance of a relationship between a tool and the user as a step in identifying more affordances in a tool. These potentials in technology can only be realized if the user and tools communicate on a regular basis. Furthermore, the framework proposed for the use of SM aims to assist teachers in considering the stages (phases) of using technology in the context of their teaching process (see Figure 3). In essence, the proposed conceptual framework has shed some light on the debate over teachers' effective use of technology.

Study IV demonstrated that SM allows active learning, thus supporting a constructivist learning paradigm, and other learning approaches and in many circumstances as a scaffold (Otchie et al., 2021).

It also became evident from my conversations with teachers that regular use of technology by these teachers provided them with the competence, control and confidence to utilize technology in the context of their teaching. This demonstrated the significance of relationships with tools in assisting users not just to discover more affordances but also to bridge the seeming knowledge gap between the operational and contextual use of a tool.

Teachers also expressed confidence during the conversation that SM is the new learning paradigm since it enables active and engaged learning while also providing chances for varied forms of learning. However, just as there are two sides to every story, teachers were eager to point out some challenges they faced while teaching via SM. This includes potential SM abuse which could lead to peer pressure, cyberbullying, among others Finally, the study was able to establish that regular dialogue or interactions with technology serve to bridge the affordances divide. Thus promoting creative and innovative use of technology leading to contextual use.

Importantly, stakeholders and policymakers could implement policies and regulations that encourage and motivate students to utilize SM constructively and productively. Finally, teachers should be encouraged and resourced to use SM's learning potentials innovatively to build professional networks of learning communities that spans many schools throughout the world.

6.2. Practical Implications

Overall, this doctoral thesis supports the premise that teachers should now focus more on contextualizing SM usage through regular interactions with the technology. The research theoretically adds to the current body of evidence by establishing the effectiveness of SM as a tool for collaboration, communication, interaction and information dissemination in teaching and learning. Furthermore, the interactive affordances of SM make it a pedagogical resource; yet, its effective use for teaching and learning is heavily reliant on maintaining regular dialogue with the tool, which facilitates competency and skills in its use. This suggests that regular access to technology, particularly the internet, is critical because when every student has access to the internet, teachers and parents will use the online educational resources to scaffold them.

Students are also much more engaged when they use technology effectively, and as a result, they obtain and retain more information. Hence, stakeholders will be interested in the findings because they serve as a wake-up call to educational technologists, facilitators and other related groups to reorient teacher professional development programs in technology toward context-based learning. Consequently, this doctoral research will be valuable in clarifying the use of SM,

which has hitherto been clouded by ambiguity between operational and contextual uses. Finally, the proposed framework will assist technology users, particularly teachers, to understand and appreciate the interaction phase as an implicit but critical component toward effective technology use.

6.3. Limitations

In terms of context and significance, the scope of this doctoral thesis was limited. The first and most significant drawback was the time required to recruit the small number of teachers needed for the research. Because the interview was done in English, the official language of the data collector, who could not speak Estonian, teachers who spoke only Estonian were unable to participate. Second, the research was self-reported and done in a virtual environment. The author might have gotten more information if he had been physically present in the classroom, but the COVID-19 lockout prevented him from doing so. Third, the sampling was convenient and purposeful, and in some cases, a snowball method was adopted. So, the author was able to find teachers with the necessary knowledge using this method. However, because the sample does not represent the entire population of Estonian high school teachers, he cannot generalize the findings. Finally, because May and June are among the busiest months for teachers, especially those in high (secondary) schools preparing their students for a major summative assessment, the majority of teachers were unable to participate in the interviews. Despite the small sample size, language barriers and other factors, the research was able to achieve its goals.

6.4. Suggestions for Future Research

More research on the interaction phase of technology use in the framework is needed to understand how tacit knowledge influences teachers' effective use of technology. A quantitative study should also be considered to measure the impact of technology's operational and contextual affordances on teaching and learning. Furthermore, time management in technology should be considered so that teachers who spend too much time on lesson preparation, as well as the overlap of working and social time, might be studied further. Again, the distractions that some students experience with SM during lessons could be addressed if both teachers and students have a better understanding of the technology and, more significantly, embrace its apparent educational affordances. This also reinforces the significance of using technology in education, specifically in pedagogy.

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APPENDICES

Appendix A.1 Interview protocol

Questions
To explore participant's profile
Tell me briefly about the class you teach. *What subject do you teach?* *How long have you been a teacher?* *What makes you use social media in general?* *Describe what you use social media for in general.*
To explore broad experiences and perspectives of participants on social media in teaching
What is your opinion about teaching with social media? *How does social media influence your teaching?* *Probe: Any example.... can you tell me more about that?* *Tell me how time impacts on your social media use in class.* *Probe: What about your students?* *Describe a typical lesson with social media.* *Tell me about your students' attitudes to social media.* *Probe? How, why? Some examples…?*
To explore and generate specific experiences of participant's use of social media
What kind of social media do you teach with? *Probe: Why...tell me more about that.* *How often do you teach with social media?* *How long have you been teaching with social media?* *Probe: Any highlights? Regrets?* *Are you the only teacher using social media?* *Does your school management support social media use in teaching?* *Probe: How? What exact support? Can you give me some examples?*
To explore specific consequences of social media use in participant's work
Tell me about any challenges you encounter in teaching using social media. *Probe: Only that.... can you give some instances?* *Any benefits or advantages you derive from teaching with social media?* *Probe? Can you cite some more instances?* *Do parents raise any concern about using social media in class?* *How will you rate teaching with social media when given a scale* of 1–5?*

*1= poor, 2 = satisfactory, 3 = good, 4 = very good, 5 = excellent

The interview addressed the following topics:

- Background of the participants (subjects, class, and years of teaching with social media)
- How participants use social media in general
- Type of social media mostly used by participants to teach
- Frequency of teaching with social media
- How participants use social media in a typical class lesson
- Impact of social media on teaching
- The attitude of participant toward social media in education
- The attitude of parents to social media in teaching
- Schools support toward technology integration

Appendix A.2. *Semi-structured interview protocol*

Part I: Pre-interview briefing

Exchange of pleasantries, introduction, expression of appreciation, brief about the interview, etc.

- Thanks for willing to participate in the interview.
- As I have mentioned before, the study seeks to understand how high school teachers use social media in their teaching activities especially during the COVID-19 pandemic.
- The aim of the research is to document the possible concepts of effectively teaching with social media and how teachers could apply it in their teaching activities.
- Our interview today will last approximately 45 minutes during which I will be asking you to show me what you did in terms of teaching with social media during the COVID-19 lockdown. Also, I will like you to tell me how you used this tool specially to teach in class, assess your students, and give homework.

- Indeed, you completed a consent form indicating that I have your permission (or not) to record our conversation.
- Are you still ok with me recording (or not) our conversation today? ___Yes ___No
- If yes: Thank you! Please let me know if at any point you want me to turn off the recorder or keep something you said off the record.
- If no: Thank you for letting me know. I will only take notes of our conversation.
- Before we start the interview, have you any questions? [Discuss questions]
- If any questions (or other questions) arise at any point in this interview, you can feel free to ask them at any time. I would be more than happy to answer your questions.

Part II: Interviewee data

1. Sex …….
2. Age …….
3. Educational level…….
4. Years of teaching…….
5. Subject(s) …….
6. Classes/Grades …….
7. Years of teaching with digital technology……
8. Years of teaching with social media…….

Part III: Actual interview questions

1. Can you **show to me (**share a screen**)** the digital T&L resources you used during the COVID-19 lockdown to teach?

   (a) Class activities/ lessons (b) Homework (c) Assessments?

2. Please **explain** how you **prepared and used** these resources for
   (a) Class activities/lessons. Probe: Any examples?
   (b) Homework. Probe: Can you elaborate with an example?
   (c) Assessments. Probe: Can you show me some examples?
3. How did you come up with this ideas? I mean selecting these resources, etc.?
4. What new possibilities or potentials have you discovered in social media (**after regular use**). Probe: Can you elaborate with some examples?
5. Can these possibilities or potentials make it a good pedagogical tool? Probe: How? Please elaborate
6. Did you encounter any challenges or uncertainties during teaching? How did you overcome it?
7. In which way has the curriculum design supported the technology you use? Probe: Can you elaborate?

Part IV: Conclusion and reflection

8. With your perspectives about social media use in teaching, what can you say about its future in teaching?
9. In which way has the COVID-19 pandemic impact your perspectives about online teaching especially with social media?
10. Before we conclude this interview, is there something about your experience with social media that you think influences how you engage with your teaching we have not yet had a chance to discuss?

Part V: Debriefing

- The main goal of interview is to allow teachers to show the exploits of social media in teaching
- Thus, sharing with me what you teachers (experts) do with social media in your teaching
- This is not evaluating you! I was just conducting an ethnographic study for research purposes and participant's anonymity will be kept.
- Generally, finding out how you cope with the lockdown and also if you'll like to continue using these tools after the pandemic
- Finally, I want to thank you for your contribution to this study.

Appendix B.1 Example of a scenario to implement SM approaches through the learning processes for learning subject-specific-knowledge and skills, and social skills.

Study phase	Subject-specific knowledge and skills	Social skills
Pre-interaction processes		
(1) setting purpose of education	teacher disseminates learning objectives through SM (Inf)	students elaborate the purpose of studying a particular topic in SM (Com)
(2) curricular knowledge	teacher provides in SM a plan for studies (Inf)	students discuss in SM how to follow that plan in collaborative settings (Int)
(3) educational context	teacher shares background information (articles, videos) about the topic in SM (Inf)	students update their SM profiles to indicate their characteristics that important to the teacher and peer students and learn about other students by contacting them (Soc)
(4) lesson planning	teacher plans specific learning activities and creates learning materials that could be used or share in SM (TLR)	students contribute in planning by giving feedback, asking clarifying questions and making recommendations in SM (Int)
Interaction processes		
(5) instructional strategies	students study a topic using materials in SM (TLR) in individual and collaborative settings (Com, Col, Int)	students share their own additional learning resources found from Internet (Inf, TLR) and learn together through online tasks in SM (Com, Col, Int)
(6) classroom management	teacher monitors students' activities and gives feedback and guidance where needed (Com, Col, Int) and students give feedback and guidance to their peers in academic and entertaining format (Int, Ent)	students learn how to regulate their own learning and group processes and build groups and networks to work together (Com, Soc)

Study phase	Subject-specific knowledge and skills	Social skills
Post-interaction processes		
(7) student assessment	teacher assesses students' learning outcomes presented in SM and gives feedback (Inf) and students assess their peers in academic and entertaining format (Inf, Ent)	teacher assesses students' learning process in SM and gives feedback (Inf) and students assess their peers in academic and entertaining format (Inf, Ent)
(8) reflection	teacher guides students' to reflect on their subject-specific skills acquired in SM (Int)	peer students reflect on their individual and group level social skills acquired in SM and on the norms, values, and behaviour of other students (Int, Soc)

Note
Approach of using SM: Coll = Collaboration, Com = Communication, Int = Interaction, Inf = Information dissemination, Ent = Entertainment, TLR = Teaching, Learning, and Resource sharing, Soc = Socialization.

EESTIKEELNE KOKKUVÕTE

Sotsiaalmeedia hariduses: sotsiaalmeediaga õpetamise kontekstualiseerimine keskhariduse tasemel

Sissejuhatus ja kirjanduse ülevaade

Sotsiaalmeedia

Sotsiaalmeedia on defineeritud kui Veeb 2.0 arvutipõhise tehnoloogia kogum, mis võimaldab kasutajatel luua virtuaalseid võrgustikke ja kogukondi ning seeläbi ise hõlpsalt sisu luua ja tarbida. Laiemalt võib sotsiaalmeediat vaadelda kui rühma sotsiotehnilisi praktikaid, mis tuginevad interaktiivsuse uuele paradigmale. Uue paradigma kohaselt ei ole veeb enam kõigest teabevaramu, vaid dünaamiline teabe- ja suhtlussfäär, võrreldav inimestest ja arvutitest koosneva elusorganismiga. Seega hõlmab termin *sotsiaalmeedia* suurt hulka rakendusi, mis võivad küll olla erineva disainifookusega: näiteks mikroblogid, suhtlusvõrgustikud, sotsiaalsed järjehoidjad, videoplatvormid, failivahetuskeskkonnad jne.

Kuna sotsiaalmeedia on perspektiivikas veebivõrgustike loomise, vastastikuse teabevahetuse, sotsiaalse lävimise ja teabe jagamise vahend, on see viimasel kümnendil pälvinud haridusteadlaste ja õpetajate-õppejõudude tähelepanu. Põhjuseks on ka asjaolu, et sotsiaalmeedial on potentsiaali hõlbustada sotsiaalset, aktiivset ja interaktiivset õppimist, mis toetab sotsiaalkonstruktivistlikku õpikäsitust (Vygotsky, 1978). Kuna sotsiaalmeediat kasutavad inimesed iga päev ning suur osa kasutajatest on noored täiskasvanud, valdavalt üliõpilased (Al Alwan et al., 2017; Dwivedi et al., 2016; Kapoor & Dwivedi, 2015), siis võib sotsiaalmeedial olla mõju sellele, kus ja kuidas inimesed õpivad (Greenhow, Robelia & Hughes, 2009).

Varasemad uuringud sotsiaalmeedia kohta hariduses on keskendunud peamiselt selle rakendamisele kõrgkoolides, keskharidusele on pööratud vähe tähelepanu (Malik et al., 2019; Mohammad et al., 2018); käesolevas doktoritöös keskendutakse aga just keskhariduse tasemele.

Lünk teadusuuringutes

Ehkki huvi sotsiaalmeedia kasutamise vastu õppeprotsessis on tänu tajutud pedagoogilistele lubavustele kasvamas, on sotsiaalmeedia kasutamise efekt uuringute lõikes ebaselge ega peegelda selle üldtunnustatud potentsiaali (Greenhow & Lewin, 2016). Põhjusi võib olla mitmeid. Probleem on selles, et õpetajad ei kasuta tehnoloogiat, et muuta seda, kuidas nad õpetavad (Linnasaari et al., 2020). Üheks põhjuseks võib siin tõepoolest olla lapsevanemate, õpetajate ja teiste sidusrühmade vahelise konsensuse puudumine. Kuid kas õpetajal on olemas oskused ja suutlikkus kasutada sotsiaalmeediat õpetamise kontekstis? Samuti võib selgete hariduspoliitiliste juhiste puudumine olla viinud õpetaja mõnikord ebakindlasse olukorda.

Siinkohal tasub ka mainida, et algselt ei olnud enamik sotsiaalmeedia rakendusi mõeldud pedagoogilisel otstarbel kasutamiseks; sellest hoolimata rakendavad õpetajad neid õpetamise ja õppimise kontekstis. Kuigi sotsiaalmeedia rakendamine tunnis võimaldab õpilasekeskset ja konstruktivistlikku lähenemist, on õpetajad alles avastamas parimat moodust, kuidas tehnoloogilised vahendid võiksid aidata neil tõhusalt oma pedagoogilisi eesmärke saavutada (Kopcha et al., 2020). Nii on ka suurenenud huvi uurida sotsiaalmeedia kasutamist haridusvaldkonnas (Van Osch & Coursaris, 2015).

Uurimiseesmärk

Et sotsiaalmeediat saaks hariduses tõhusalt ja mõtestatult kasutada, tuleks teadlastel uurida, kuidas õpetajad sotsiaalmeediat oma õpetamispraktikas kontekstualiseerivad ning seda tehes mõnikord ka innovatsioonini jõuavad. Sotsiaalmeedia kontekstualiseerimine on midagi enamat kui lihtsalt tehnoloogia kasutamise oskus: see tähendab õppimiseks sobiva keskkonna loomist ja selliste mõtlemist soodustavate vahendite pakkumist, mis aitaksid õpilastel oma küsimustele vastata. Den Beemti ja tema kolleegide (2020) sõnul peitub sotsiaalmeedia pedagoogilises kasutamises suur potentsiaal. Siit tulenebki käesoleva doktoritöö eesmärk: paremini mõista, kuidas õpetajad sotsiaalmeediat oma õpetamispraktikas kontekstualiseerivad, et selle potentsiaali maksimaalselt ära kasutada.

Doktoritöö eesmärgid

Ühelt poolt soovitakse siinse doktoritööga aidata õpetajatel mõista ja hinnata sotsiaalmeedia regulaarse kasutamise vajadust, et saavutada selle kasutamises vilumus ning avastada ka rohkem pedagoogiliselt väärtuslikke lubavusi. Teisalt võimaldab doktoritöö õpetajatel neid vahendeid kasutada, kontekstualiseerides need lubavused oma õpetamisprotsessis. Doktoritöö eesmärgid olid järgmised:

- selgitada välja, milliste meetoditega keskkooliõpetajad ja -õpilased sotsiaalmeediat õpetamiseks ja õppimiseks kasutavad (I artikkel);
- selgitada välja, kuidas õpetajad keskhariduse tasemel sotsiaalmeediaga õpetavad (II ja III artikkel);
- selgitada välja, kuidas kontseptualiseerida sotsiaalmeedia kasutamist keskhariduse tasemel (IV artikkel);
- selgitada välja, kuidas õpetajad keskhariduse tasemel sotsiaalmeedia kasutamist kontekstualiseerivad (V artikkel).

Töö eesmärkide saavutamiseks sõnastati neli uurimisküsimust:

- Milliste meetoditega õpetajad ja õpilased keskhariduse tasemel sotsiaalmeediat kasutavad?
- Kuidas õpetajad keskhariduse tasemel sotsiaalmeediaga õpetavad?
- Kuidas kontseptualiseerida sotsiaalmeedia kasutamist keskhariduse tasemel?
- Kuidas õpetajad keskhariduse tasemel sotsiaalmeedia kasutamist kontekstualiseerivad?

Doktoritöö koosnes neljast uuringust, mis viidi läbi Eesti keskhariduse kontekstis ning mis keskendusid sellele, kuidas õpetajad sotsiaalmeediaga õpetavad ja seda tajuvad. Töö eesmärk oli ületada tajutud lõhe sotsiaalmeedia õppetöös kasutamise ja pedagoogiliste lubavuste vahel, viies nii kokku sotsiaalmeedia operatsioonilise ja sisulise kasutuse õpiprotsessis; ning seega tagada, et õpetajad saavutaksid oskuse sotsiaalmeedia vahendeid kontekstualiseerida, et neid õpitegevustes sihipäraselt kasutada.

Teoreetiline raamistik

Uuringu rahvusvahelisse konteksti paigutamiseks kasutasime mõisteid *lubavus* (varem tõlgitud ka kui „võimaldus“ või „sobimus“, ingl *affordance*), *vahendi sisetunnetus* (Polanyi'lt pärit *dwelling in a tool* või *indwelling*) ja *konstruktivism*. Gibsoni (1979) sõnul on keskkonna lubavus see, „mida ta loomale pakub, mida ta annab või millega teda varustab, kas heaks või halvaks“ (lk 127). Lubavuste avastamiseks on kriitilise tähtsusega looma suhe keskkonnaga, usub Gibson. Kuigi Gibsoni mõiste pärineb ökoloogia kontekstist, on see rakendatav kõikides valdkondades, sealhulgas tehnoloogias. Gibson rõhutab oma lubavuse mõistega, et kõik esemed võimaldavad mitmesuguseid kasutusviise: „Fakt, et kivi on viskerelv, ei tähenda, et see ei võiks olla ka muid asju. See võib olla paberiraskus, raamatuhoidja, haamer või pendlikeha“ (lk 126). Vaatame näiteks sotsiaalmeediat kui keskkonda – nii võib sotsiaalmeediat kasutada erinevates kontekstides ning seega on sel potentsiaali pakkuda head või halba. Lubavused jätavad tehnoloogia kasutamise konteksti mitte tööriista, vaid kasutaja kätesse. Seega on tööriist neutraalne, kuni seda kindlates kontekstides kasutama hakatakse. Kasutaja suhe selle keskkonnaga sõltub aga sellest, millist lubavust keskkond pakub.

Norman (1988) arendab hiljem Gibsoni lubavuste mõistet edasi spetsiifilises inimese-arvuti interaktsiooni kontekstis. Normani jaoks viitab mõiste *lubavus* eseme tajutud ja tegelikele omadustele, peamiselt neile olulistele omadustele, mis määravad, kuidas eset kasutatakse. Näiteks pakub tool tuge ja võimaldab seega istumist. Tooli saab ka kaasas kanda (Davis & Chouinard, 2016, lk 243; Norman, 1988, lk 9). Mõistet edasi selgitades kirjeldab Norman tegelikke lubavusi kui

eseme funktsioone, potentsiaali, mida ese pakub. Tajutud lubavused on aga eseme need funktsioonid, mis on kasutajale selged.

Vaatamata erinevatele arvamustele lubavuste mõiste osas seob neid siiski üks ühine joon – suhe. Suhe on teadmise implitsiitne mõõde, mis on omandatud kogemuse kaudu ja mida ei saa üle kanda ega dokumenteerida. Polanyi (1983) nimetab seda vaiketeadmiseks. Tema sõnul tuleb vahendi kasutamiseks vajaliku vaiketeadmise arendamiseks vahendit tunnetada (ingl *dwell in the tool*), et oleks võimalik selle kasutamist eesmärgipäraselt ja mõtestatult kontekstualiseerida (lk 10–13). Vahendi sisetunnetuse all mõtleb Polanyi, et on vaja sellist suhet, kus inimese tunnetus muutub esemega sünkroonseks, nii et ese muutub nagu inimese käe pikenduseks. See tähendab, et suhe tehnoloogiaga on tehnoloogia tõhusa kasutamise saavutamisel kõige olulisem tegur. Seetõttu on väga oluline arendada sotsiaalmeediaga regulaarset dialoogi, et leida rohkem lubavusi, mis võiksid viia sotsiaalmeedia kontekstualiseerimiseni.

Nagu eespool mainitud, on sotsiaalmeedial potentsiaali hõlbustada sotsiaalset, aktiivset ja interaktiivset õppimist. Selline õppimine on kooskõlas ideega, et õpilased loovad sotsiaalse vastastikmõju kaudu aktiivselt uut teadmist ning teevad seda läbi toetusvahendite (ingl *scaffolds*) ja toestava suunamise (ingl *scaffolding*) (Vygotsky, 1978). Selles kontekstis on kasulik eristada toestavat suunamist kui protsessi ja toetusvahendeid kui vahendeid ja esemeid. Toestav suunamine tähendab protsessi, mille käigus toimub oskuste ja informatsiooni internaliseerimine dialoogi ja hoolikalt kohandatud toetuse kaudu. Toestava suunamise protsessi teoreetiliseks aluspõhjaks on Võgotski sotsiokultuuriline teooria. Toetusvahendid seevastu on vahendid, mis aitavad käsilolevat ülesannet lahendada (Puntambeker, 2021). Seetõttu on toetusvahendite tähendus piiritletum – nende puhul on tegu lihtsalt sekkumiste või vahenditega, mida õpilastele ülesande lahendamiseks pakutakse (Pea, 2004; Stone, 1998b). Toetusvahendid on näiteks tehnoloogilised vahendid (sotsiaalmeedia), kuid need võivad olla ka sotsiaalsed, seotud inimsuhetega.

Metoodika ja tulemused

Käsitlemaks õpetajate probleeme sotsiaalmeediaga õpetamisel jagati doktoritöö neljaks uuringuks: **I uuring** oli kirjanduse ülevaade, mille eesmärk oli uurida sel teemal varem tehtud uuringuid ning kuidas õpetajad ja õpilased sotsiaalmeediat hariduse kontekstis kasutavad. EBSCOhost andmebaasidest otsiti ja valiti välja kümme uuringu eesmärkidele vastavat artiklit. Süstemaatilise kirjandusanalüüsi tulemused näitasid, et suhteliselt vähem oli uuritud sotsiaalmeedia kasutamist keskhariduse tasemel. Siiski tuvastasime seitse meetodit, millega õpetajad ja õpilased sotsiaalmeediat kasutavad: 1) vastastikune teabevahetus (*communication*); 2) teabe jagamine (*information*); 3) vastastikmõju (*interaction*); 4) koostöö tegemine (*collaboration*); 5) sotsiaalne lävimine (*socialization*); 6) õpetamine, õppimine ja ressursside jagamine (*TLR – teaching, learning and resource sharing*);

ning 7) meelelahutus (*entertainment*). Õpetamine, õppimine ja ressursside jagamine (TLR) oli paraku üks vähim kasutatud meetodeid, kuid kuna TLR on õpetamise ja õppimise juures väga oluline komponent, otsustasime seda edasi uurida. Nii jõudsime **II uuringuni**, kus palusime valitud Eesti keskhariduse taseme õpetajatel, kes on varem sotsiaalmeediat õppetöös kasutanud, jagada meiega oma kogemusi, vaatenurki ja väljakutseid. Uuring toimus intervjuu vormis Zoomi keskkonnas ning õpetajatele oli osalemine vabatahtlik. Intervjuudest õpetajatega tuvastasime kaks mõistet, mis seonduvad sotsiaalmeedia lubavustega õpetamisel: 1) operatsioonilised (tehnilised) lubavused (ingl *operational (technical) affordances*) ja 2) sisulised (pedagoogilised) lubavused (ingl *contextual (pedagogical) affordances*). Näiteks paigutub sotsiaalmeedia kasutamine ressursside jagamiseks, teabe edastamiseks, õpilaste ühendamiseks akadeemilises foorumis jms operatsiooniliste (tehniliste) lubavuste alla ning siin ei ole mingil juhul tegu sisulise kasutamisega: konkreetne vahend ongi selliseks ülesandeks loodud (disainifookus) ja igaüks saab seda sarnase ülesande puhul kasutada, erinevates kontekstides. Seega täheldasime, et sotsiaalmeediaga tõhusalt õpetamiseks tuleb õpetajatel disainifookusest (operatsioonilistest lubavustest) edasi liikuda ja suuta tehnoloogiat mõtestatult rakendada õpetamise kontekstis (sisulised lubavused). See viis meid **III uuringuni**, milles käsitasime operatsiooniliste ja sisuliste lubavuste mõisteid. Vaatlesime lubavuste mõisteid läbi Gibsoni, Normani ja Polanyi käsituste. Kõigil neil mõistetel on üks ühine läbiv joon: suhted. Suhe on teadmise vaikiv mõõde, mida saab omandada ainult läbi kogemuse ja mida ei saa ei jagada ega dokumenteerida (Polanyi, 1983). Tehnoloogia tõhusa kasutamise kõige olulisem komponent on seega tehnoloogiaga oma suhte loomine. Seetõttu on väga tähtis pidada sotsiaalmeediaga pidevat dialoogi, et avastada rohkem lubavusi, mis saavad viia sotsiaalmeedia kasutuse kontekstualiseerimiseni. Sellele tuginevalt pakkusime välja sotsiaalmeedia kasutamise raamistiku. Lõpuks viisime uute õpetajatega läbi veel ühe intervjuu. Seekord uurisime, kuidas nad oma digitaalset õppevara ette valmistavad ja kuidas tehnoloogia abil õpetavad. Nii jõudsime **IV uuringuni**. Meie õpetajatega tehtud intervjuu tulemused kinnitavad, et sotsiaalmeedia sisuline kasutamine hõlmab rohkem kogemuslikke teadmisi ja pädevust, mis on „vaikivad“ ja mida saab omandada ainult suhete kaudu.

Arutelu, järeldused ja soovitused

Meie uuringu tulemused on täiendav panus varasematesse uuringutesse, mis käsitlevad sotsiaalmeediaga õpetamist, eriti keskhariduse tasemel (Galvin & Greenhow, 2020; Greenhow & Askari, 2017b; Manca et al., 2021; Stewart, 2015).

Täheldasime, et erinevalt operatsioonilisest kasutusest ei ole selge, kuidas õpetaja jõuab vahendi kasutamise sisuliste oskuste ja pädevuste omandamiseni. Polanyi (1962) järgi võime väita, et selliste oskuste ja pädevuste omandamise protsess põhineb vaiketeadmise arendamisel, mis on isiklik ja kogemuslik. Niisiis iseloomustab sisulist lubavust teatav avatus ja loovus, mis laseb kasutajatel konteksti määrata. See toetab Angeli ja Valanidese (2018) tähelepanekut, et

vahendi operatsiooniliste lubavuste muutmine sisulisteks lubavusteks nõuab kasutajalt loomingulist mõtlemist. Niisiis on pedagoogilise mõju saavutamiseks väga oluline viia uuenduslikul viisil kokku operatsioonilised oskused ja kogemused. Meiepoolne terminite *operatsioonilised lubavused* ja *sisulised lubavused* kasutuselevõtt on seega samm tehnoloogia tõhusa kasutamise nüansside mõistmise suunas. Samuti näitab meie kavandatud raamistik praktiliselt, kuidas neid mõisteid operatsionaliseerida.

Oma järelduses oleme seisukohal, et operatsiooniline kasutus on tehnoloogia nüansside mõistmiseks väga oluline. Kuid et oleks võimalik tehnoloogiat konkreetses kontekstis tõhusalt kasutada, on väga oluline astuda tehnoloogiliste vahenditega regulaarsesse dialoogi. Nii võib leida lisaks operatsioonilistele lubavustele veel teisigi. See aitab kasutajal tehnoloogiat oma kontekstis maksimaalselt hästi ära kasutada. Seega tuleks õpetajatel ja õpilastel rohkem keskenduda oskustele ja kogemustele, mis on „vaikivad“ ja mida saab omandada ainult tehnoloogiaga korrapärast dialoogi pidades.

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This PhD journey was undoubtedly fraught with uncertainties, as was the narrative of many intellectual forbearers. However, this journey also appears to be one of a kind due to the numerous mountains and valleys I encountered. But a faint voice within kept telling me to keep going. And today, the ultimate milestone has been reached. And those who held my hands and carried me up as I climbed those mountains and spanned those valleys deserve to be recognized and honored.

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PUBLICATIONS

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Career and job summary

2021 – to date	Junior Research Fellow, University of Tartu (UT)
2020–2021	Specialist in Educational Technology, University of Tartu / Institute of Education
2017–2017	Principal – **North Legon Little Campus** (International School)
2012–2017	Head of secondary department – **North Legon Little Campus** (Cambridge International curriculum) North Legon
2011–2012	**Golden Bridge Academy @ Ajumako, Ghana** School Administrator
2007–2011	**Alsyd Academy @ Airport Residence, Accra, Ghana** Head of Science Department
2004–2007	**Jack and Jill School @ Roman Ridge, Accra, Ghana** Head of Science Department
2000–2011	**Otchill Ltd**. Dealer in imported used European and Asian cars Director
1999–2004	**Tema Christian Centre @ Tema, Ghana** Assistant Headmaster / Science Teacher
1997–1999	**Bawku Secondary School @ Bawku, Upper East Region, Ghana** Science Resource Coordinator & Science Teacher
1997–2017	**West African Examinations Council @ Headquarters, Accra, Ghana** Senior Examiner for BECE[1] & WASSCE[2] examinations, respectively

[1] BECE = Basic education certificate examinations. An international examination conducted across the 5 English speaking West African countries for candidates to proceed to senior secondary and vocational schools

[2] WASSCE = West African Senior Secondary Certificate Examinations. An international exam across 5 English speaking West African nations for candidates' entry to universities and polytechnics

Academic path, degrees and diplomas

2017–to date	**Doctor of Philosophy** (PhD) in Educational Science, University of Tartu, Estonia
2013–2015	**Master of Philosophy** (MPhil) in Educational Innovations and Leadership Science, Kwame Nkrumah University of Science and Technology, Ghana
2005–2006	**Diploma in Administration and Management**, Chartered Institute of Administration and Management Consultants, Ghana
1992–1997	**Bachelor of Science** (BSc) in Biological Science & **Diploma in Education**, University of Cape Coast, Ghana

Research and publications

2022	Otchie, W.O., Bardone, E., & Pedaste, M. (2022*)*. Bridging the pedagogical gap between operational and contextual affordances with social media applications. *Encyclopaideia. Journal of Phenomenology and Education. 26*(62)
2021	Otchie, W.O., Pedaste, M., Bardone, E. (*in press*). Social media education: Theorizing the concept of affordances and contextualizing technology tools. *Canadian Journal of Leaning and Technology*
2021	Otchie, W.O., Pedaste, M., Bardone, E., & Chounta, I-A. (2021). Contextualizing social media ecology and its pedagogical affordances: the perspective of high school teachers, *Electronic Journal for e-Learning. 19*(6), pp. 471–488, available online at www.ejel.org
2020	Otchie, W.O., Pedaste, M., Bardone, E., & Chounta, I-A. (2020) Can YouTube videos facilitate teaching and learning of STEM subjects in high schools? *IEEE bulletin of the Technical Committee on Learning Technology*, *20*(1), 3–8
2020	Otchie, W.O.& Pedaste, M. (2020). Using Social Media for Learning in High Schools: A Systematic Literature Review. *European Journal of Educational Research*, *9*(2), 889−903 https://doi.org/10.12973/eu-jer.9.2.889
2019	Otchie, W.O. & Pedaste, M. (2019). Social Media as a Learning Management System: Is it a Tool for Achieving the Goal of "Education for All"? *US-China Education Review*, *9*(2), 79−90. https://doi.org/10.17265/2161-623X/2019.02.003
2018	Otchie, W. O. (2018). Evidence-Based Teaching in Higher Education. *International Perspectives on University Teaching and Learning Symposium, Orlando, Florida, U.S. 30 May, 2018.* Auburn University

Communal service

2008–2010	Co-Founder and Leader, National Democratic Youth Club @ Madina, Accra
2007–2011	Patron, Alsyd Academy SRC
1995–1996	President of Adisadel College Old Boys Association of University of Cape Coast
1995–1996	Acting Manager @ ATL FM, University of Cape Coast
1993–1996	Radio presenter @ ATL FM, Cape Coast

Awards and recognitions

2019	Best International PHD Student Award @ Institute of Education (UT)
2017	Best Science Teacher (Annual Cambridge IGCSE teachers award)
1991	Best National Service Personnel for Axim District/ Western Region, Ghana
1990	Best GCE[3] A-Level Student in Physics
1988	Best SC[4] O-Level Student in Economics
1988	Best SC O-Level Student in Technical Drawing

Organizational membership and research activities

2021–2022	Advising on the UNRWA education digitalization programme
1999–2017	Graduate Science Teachers' Association of Ghana (GRASAG)
2001–2017	Ghana Association of Science Teachers (GAST)
2001–2017	Ghana National Association of Graduate Teachers (GNAGRAT)

Certifications from MOOC

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Issuing authority: Coursera Course Certificates
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Credential ID: GC52YBW8ENL6
https://www.coursera.org/account/accomplishments/certificate/GC52YBW8ENL6

[3] GCE A-Level = General Certificate of Education-Advanced Level (A 2-year college education)

[4] SC O-Level =School Certificate-Ordinary Level (A 5-year secondary education)

Budgeting and Scheduling Projects
Issuing authority: Coursera Course Certificates
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Credential ID: 4LRRASSYS88R
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Credential ID: E9L4ESDYMZZL
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Issuing authority Coursera: Course Certificates
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Teenistuskäik

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2017–2017	**North Legon Little Campus** (rahvusvaheline kool), direktor
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2004–2007	**Jack and Jill School, Roman Ridge, Accra, Ghana**, loodusainete osakonna juhataja
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1997–1999	**Bawku Secondary School, Bawku, Upper East Region, Ghana**, loodusainete ressursside koordinaator ja loodusainete õpetaja
1997–2017	**West African Examinations Council, Headquarters, Accra, Ghana,** BECE[1] ja WASSCE[2] eksamite vanemeksamineerija

[1] BECE = Basic Education Certificate Examinations. Rahvusvaheline eksam viies inglise keelt kõnelevas Lääne-Aafrika riigis, mis võimaldab astuda gümnaasiumisse või kutsekooli

[2] WASSCE = West African Senior Secondary Certificate Examinations. Rahvusvaheline eksam viies inglise keelt kõnelevas Lääne-Aafrika riigis, mis võimaldab astuda ülikooli või polütehnikumi

Haridustee, kraadid ja diplomid

2017 – …	**Filosoofiadoktor** (PhD) haridusteaduses, Tartu Ülikool, Eesti
2013–2015	**Magistrikraad** (MPhil) haridusinnovatsioonis ja juhtimises (*Educational Innovations and Leadership Science*), Kwame Nkrumah University of Science and Technology, Ghana
2005–2006	**Diplom halduses ja juhtimises** (*Diploma in Administration and Management*), Chartered Institute of Administration and Management Consultants, Ghana
1992–1997	**Loodusteaduse bakalaureus** (BSc) bioloogias ja **haridusteaduse diplom** (*Diploma in Education*), University of Cape Coast, Ghana

Teadustöö ja publikatsioonid

2022	Otchie, W.O., Bardone, E., & Pedaste, M. (2022*)*. Bridging the pedagogical gap between operational and contextual affordances with social media applications. *Encyclopaideia. Journal of Phenomenology and Education. 26*(62)
2021	Otchie, W.O., Pedaste, M., Bardone, E. (*in press*). Social media education: Theorizing the concept of affordances and contextualizing technology tools. *Canadian Journal of Leaning and Technology*
2021	Otchie, W.O., Pedaste, M., Bardone, E., & Chounta, I-A. (2021). Contextualizing social media ecology and its pedagogical affordances: the perspective of high school teachers, *Electronic Journal for e-Learning. 19*(6), pp. 471–488, available online at www.ejel.org
2020	Otchie, W.O., Pedaste, M., Bardone, E., & Chounta, I-A. (2020). Can YouTube videos facilitate teaching and learning of STEM subjects in high schools? *IEEE bulletin of the Technical Committee on Learning Technology*, *20*(1), 3–8
2020	Otchie, W.O.& Pedaste, M. (2020). Using Social Media for Learning in High Schools: A Systematic Literature Review. *European Journal of Educational Research*, *9*(2), 889−903. https://doi.org/10.12973/eu-jer.9.2.889
2019	Otchie, W.O. & Pedaste, M. (2019). Social Media as a Learning Management System: Is it a Tool for Achieving the Goal of "Education for All"? *US-China Education Review*, *9*(2), 79−90. https://doi.org/10.17265/2161-623X/2019.02.003
2018	Otchie, W.O. (2018). Evidence-Based Teaching in Higher Education. *International Perspectives on University Teaching and Learning Symposium, Orlando, Florida, U.S. 30 May, 2018.* Auburn University

Kogukondlik teenistus

2008–2010	National Democratic Youth Club, Madina, Accra, kaasasutaja ja juht
2007–2011	Alsyd Academy SRC, patroon
1995–1996	Adisadel College Old Boys Association of University of Cape Coast, president
1995–1996	ATL FM, University of Cape Coast, tegevjuht
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Autasud ja tunnustused

2019	Parima välisdoktorandi auhind, Tartu Ülikooli haridusteaduste instituut
2017	Parim loodusainete õpetaja (iga-aastane Cambridge IGCSE õpetajate auhind)
1991	Parim riigitöötaja piirkonnas Axim District / Western Region, Ghana
1990	Parim *GCE*[3] *A-Level* õpilane füüsikas
1988	Parim *SC*[4] *O-Level* õpilane majanduses
1988	Parim *SC O-Level* õpilane joonestamises

Organisatsiooniline kuuluvus ja teadustegevus

2021–2022	UNRWA hariduse digitaliseerimise programmi nõustamine
1999–2017	Graduate Science Teachers' Association of Ghana (GRASAG)
2001–2017	Ghana Association of Science Teachers (GAST)
2001–2017	Ghana National Association of Graduate Teachers (GNAGRAT)

MOOCi tunnistused

Managing Projects Risks and Changes
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Väljastamise aeg: juuni 2016
Tunnistuse number: 4LRRASSYS88R
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[3] GCE A-Level = General Certificate of Education – Advanced Level (2-aastane kolledži-haridus)

[4] SC O-Level = School Certificate – Ordinary Level (5-aastane keskharidus)

Initiating and Planning Projects
Väljastanud asutus: Coursera Course Certificates
Väljastamise aeg: juuni 2016
Tunnistuse number: E9L4ESDYMZZL
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Väljastanud asutus: Coursera Course Certificates
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