Research Article

Explanatory videos in the context of learning processes: An interdisciplinary interpretative interaction analysis of production and reflection processes

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The article focuses the use and reflection of explanatory videos in pedagogical contexts from an interdisciplinary perspective and with regard to teacher reflection and production processes in a joint primary school pedagogical study (with a focus on mathematical learning processes) and Catholic religion education study (with a focus on secondary school teacher education). With an explorative research question and an interpretative qualitative research design, teachers' reflections of explanatory videos produced by learners as well as teachers are analyzed abductively to gain in-depth insights into potentials and obstacles of the usage of explanatory videos in the context of learning processes. In the primary school pedagogical study, students produce multilingual explanatory videos (n = 18) of the 'Auxiliary task', a mental calculation strategy, which the multilingual teachers reflect (n = 6), and in the Catholic religion education study, teachers produce explanatory videos for making 'encountering' processes possible (n = 17) and both studies are linked with a joint research question. The main insights into potentials and obstacles are that explanatory videos can be used didactically for a) identifying student's subject-and-language-related needs, b) 'decelerated' valuation processes and c) iterative revisions of non-viable video productions as well as biases and beliefs of teachers.

Keywords: Explanatory videos; Digital media; Professional development; Interpretative interaction analysis

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1. Introduction

The digitalization of educational contexts in general, and of schools in particular, is one of the biggest international challenges and can be considered a 'key task' for each country (Huwer et al., 2019; Schmidt, 2020). Besides technical aspects such as the availability of (fast as well as stable) internet and adequate hardware, pedagogical intentions and goals require the viable and learning-process-related usage of software, tools, and apps. Therefore, media education and specialized didactics often demand the meaningful and learning-process oriented use of digital media, e.g. of explanatory videos or podcasts (Dorgerloh & Wolf, 2020; Klinger & Walter, 2022; Kommer et al., 2021; Kulgemeyer, 2020a, 2020b; Kuzu, 2023c; Leinhardt, 2001, 2010; Mayer & Fiorella, 2022;

Nitsche, 2020; Ratzke & Meyer, 2022, 2024; Schreiber & Klose, 2017; Tenberg, 2021). Especially explanatory videos are an often-used format and important reasons why explanatory videos are so popular in pedagogical contexts are, among other aspects, that they a) can offer alternative or repeatedly watchable explanations and b) are an essential format on internet and social media plattforms, thus being part of the digital realities of children and adolescents ('digitalities', see section 2.1), which is why explanatory videos are often well received by learners, especially in sciences and various other school subjects (Kommer et al., 2021; Schorn, 2022). Yet, many teachers are reluctant to use digital media and this negative attitude is only gradually changing: E.g., Dorgerloh and Wolf (2020) showed that teachers still tend to distrust digital media in general and the use of explanatory videos in specific.

Therefore, analyzing teachers' reflections exploratively is important to gain insights into possible beliefs as well as perceived potentials and obstacles of teachers who actively use digital media, especially explanatory videos (Dorgerloh & Wolf, 2020; Huwer et al., 2019). This is important since teachers play a central role in the implementation of explanatory videos in the classroom – whether as creators of explanatory videos or in supporting learners in the creation of explanatory videos (see section 2.1) – and since they also decide on the frequency and intensity of the didactical implementation, in-depth insights into their reflection processes are required and could provide important 'field insights' into didactic potentials, obstacles or research requirements.

Accordingly, the aim of this article is to provide insights into teacher reflection processes about potentials, obstacles, and conditions of the production of explanatory videos in practice. With this in mind, selected studies from the context of mathematics and Catholic religion education are put into perspective with a joint explorative research question on teachers' reflections (see section 2.2) in order to conduct an interdisciplinary investigation of teachers' reflections (see section 2.2) and production processes of explanatory videos (see section 4). The intention is to provide explorative insights into the teachers' individual beliefs, ideas and interpretations of the use of explanatory videos in order to gain not only theoretical but also school-related findings and to reconstruct individual notions and reflections (see section 2.2; section 4).

2. Theoretical Background: Interdisciplinary Perspectives on Explanatory Videos and Teacher Reflections

The study of explanatory videos on the one hand and the study of teacher reflections on explanatory videos on the other requires a precise definition of both terms and underlying theoretical aspects (e.g., the definition of explanations and individual notions). In the following sections, both sets of terms are defined, with particular consideration of interdisciplinary aspects and principles.

2.1. Explanatory Videos, Digital Media and Digitality in the context of Learning Processes

Explanatory videos are digital media, which means that they consist of binary coded data that are received or computed by terminal systems like PC's, tablets, etc. and translated by specific software on these systems, like video apps or programs, into textual, auditive and visual elements like pictures, films, etc. (Hassan et al., 2023; Thyssen et al., 2023). Thus, being digital media, explanatory videos are part of the so-called digitality, which according to Thyssen et al. (2023) is a term coined from the root word 'digital' and 'reality', referring in a constructivist sense (see section 2.2) to the fact that digital media is situated in specific digital experiences and contexts and that these situated experiences influence how humans interpret them (Gogus, 2012; Lin, 2022; Ludes-Adamy & Schütte, 2018; Schneider et al., 2012; Thyssen et al., 2023; Waxer & Morton, 2012). In other words, digital media like explanatory videos, might influence, how viewers construct their realities and how they interpret the presented information by allowing experiences that would otherwise not be possible, like walking on the moon in virtual reality etc. An example from the primary school pedagogical context for such an experience is the number line (see Figure 1).

Figure 1

A static 'zoomed-in' number line on the left, non-digital (Krauthausen, 2018, p. 323); a dynamic zooming-in process captured on the right side, digital (in the Applet 'Zooming Decimals' from The Dynamic Number Project)
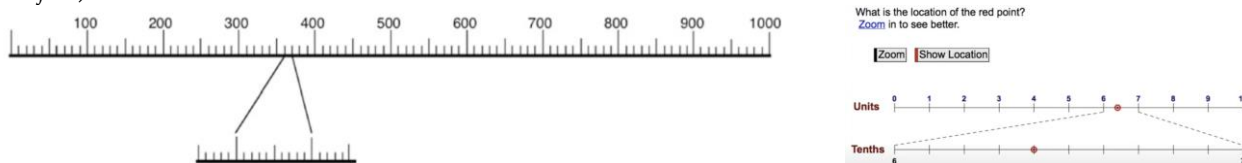
By allowing a user or viewer to see the seamless 'zoom in' process in-between numbers, learners can see the meaning of fractions, infinity, and infinite fractioning much better than through a static picture (see Figure 1) (Krauthausen, 2018; Schulz & Walter, 2019; Walter & Dexel, 2020).

Explanatory videos are defined as *"self-produced films that explain how to do something or how something works, or in which abstract concepts are explained."* (Wolf, 2015, p. 123, translated by authors). As the name suggests, the main linguistic feature of explanatory videos is a speech act of the explanation type. In linguistics, this is understood to be an act in which there are *"a speaker and a listener who have different starting points. The listener lacks knowledge about a certain situation and is looking for an explanation. This is provided by the speaker, who the listener assumes has more knowledge about the situation. The initial situation thus represents a difference in knowledge between the listener and the speaker, which is to be compensated for by the speaker's speech act in the form of building up or expanding the listener's knowledge"* (Maisano, 2019, pp. 19-20, translated by authors). In didactic contexts, however, the knowledge difference between listener and speaker can also be functional, e.g., a teacher can ask for an explanation from a learner even if the latter already has the necessary knowledge (Berthold, 2012; Maisano, 2019; Redder et al., 2013). A distinction can be made between three types of explanation: 1) Explaining-WHAT: Conceptual explanations of terms, e.g., on the question *"What does the fraction 1/3 mean?"*, 2) Explaining-WHY: Explanations of causes, conditions, etc., e.g., on the question *"Why is the fraction 1/3 smaller than 1/2?"* and 3) Explaining-HOW: Explanation of *procedures, actions processes*, e.g., not only descriptive, but also with explanations of the procedural backgrounds, e.g., on the question *"How can you compare fractions by 'coarsening' and 'refining' (and why does this work)?"* (Gray & Tall, 1992; Klein, 2009; Kuzu, 2019; Schmidt-Thieme, 2009; Wagner & Wörn, 2011).

Even though the fundamental potential of explanatory videos is widely recognized in the discourse on the use of digital media and technologies, i.e., through their potential to motivate learners, reduce the volatility of knowledge or for multimodal knowledge transfer (Beautemps & Bresges, 2021, 2022; Berthold, 2012; Dorgerloh & Wolf, 2020; Huwer et al. 2019; Kommer et al., 2021; Krämer & Böhrs, 2016; Nitsche, 2020; Tenberg, 2021), however, in learning-process oriented didactic literature, it is frequently criticized that the production of explanatory videos harbors the risk of a lack of cognitive activation or passive consumption, an excessive focus on procedures and processes and 'questionable quality' in the production of explanatory videos (Korntreff & Prediger, 2022; Krauthausen, 2012; Schacht et al., 2019). For example, content-related errors, incorrect explanations, and a misleading use of language means – especially of epistemic language means (meaning language means that are necessary for *understanding* concepts and meanings, see Kuzu, 2023e) – could reinforce misconceptions (Korntreff & Prediger, 2022; Kulgemeyer, 2020a, 2020b; Kunsteller, 2022; Leiningen, 2020). Six central design principles, with no claim to be exhaustive, can be reconstructed from the relevant (specialist) literature with regard to the production of viable explanatory videos (Bateman et al., 2021; Bateman & Schmidt-Borcherding, 2018; Krauthausen, 2012; Knoblauch, 2022; Kulgemeyer, 2020a, 2020b; Kulgemeyer, & Peters, 2016; Kulgemeyer & Wittwer, 2022; Kunsteller, 2021; 2022; Kuzu, 2023c, 2024; Römer & Nührenbörger, 2018; Schacht et al., 2019; Wolf, 2015):

1. *Fostering a conceptual understanding prior to the explanation of the procedures*: This means that not only procedural knowledge, e.g., knowledge about how to perform actions, but also an *understanding* the actions and objects before conducting procedures should be an important part of explanatory videos so that learners do not build up one-sided, exclusively procedural knowledge (Barzel et al., 2013). One-sided knowledge harbors the risk of a short-term learning effect and leads to an insufficiently consolidated and connected understanding of concepts in a long-term perspective (Gray & Tall, 1992).

2. *Use of dynamic visualizations (enactive-iconic-symbolic) and multimodality (auditory-textual-visual)*: Explanatory videos show a high potential for interweaving different channels of perception. For example, explanations can be spoken, images can be shown and texts can be superimposed at the same time (Krauthausen, 2012). The images that are shown can also be real images or iconic representations and the video itself can also depict enactive actions so that there are ample opportunities to promote a conceptual understanding in the sense of, e.g., the EIS principle (meaning a sequencing and reflection of **e**nactive actions, **i**conic representations and **s**ymbolic condensations, see Bruner, 1974, 1977) and/ or through activation phases that are embedded in the explanatory video (Käpnick, 2014; Kuzu, 2023c).

3. *Subject- and language-sensitive design by using clear, meaning-related language means*: According to Korntreff and Prediger (2022), the creation of explanatory videos requires a precise prior knowledge, analysis, and use of epistemic language means (language means for understanding the *meaning* of concepts and objects), as language is a central medium for understanding the meaning of concepts and objects (Korntreff & Prediger, 2022; Kuzu, 2023d, 2023e).

4. *'Natural differentiation' and heterogeneity-sensitive tasks to produce videos based on learners' prior knowledge*: Römer and Nührenbörger (2018) refer to the potential for 'natural differentiation' through the use of learner explanatory videos, meaning a production process, where learners can choose examples, language means, representations, explanations, etc. individually. 'Natural differentiation' is understood as offering an inclusive and explorative learning environment with multiple access paths and processing options for all learners (in particular, the paths and depth of solutions, and the usage of tools and representations are 'opened') (Wittmann, 2021)

5. *Creating transparency and clarifying the relevance of video production for learners*: The production of explanatory videos can be meaningfully framed for learners, e.g., when videos are produced by older learners for younger learners (Schacht et al., 2019). This offers the advantage of making visible to learners why explanatory videos are produced and, in addition to motivational advantages, the changed context of creation also shows that learners sometimes make more efforts to explain more thoroughly or more precisely, as they try to put themselves in the position of the younger learner (Kuzu, 2023c, 2024; Schacht et al., 2019).

6. *Clear structure and coherence through planning processes and successive creation*: Kunsteller (2021) points out that the production of explanatory videos, especially of complex content-related ones, can lead to specific obstacles in the production process, for example with regard to the coherence of the videos. To meet these challenges, learners should make use of storyboards, in which they can pre-structure the video takes, the materials used and the required language in advance and adapt them during the filming process, especially between 'takes' (different shots) (Leinigen, 2019; Kunsteller, 2021, 2022).

In addition to these design principles, explanatory videos can be categorized according to the producer and addressee: Learners can produce explanatory videos for other learners or for teachers, and teachers can produce explanatory videos for learners or for other teachers (see Table 1).

Table 1
An overview of different formats of explanatory videos

	Explanatory videos from….			
	…learners for learners	…learners for teachers	…teachers for teachers	…teachers for learners
Didactic Intention	Principle of 'Learning by Teaching' (Grzega & Schöner, 2008); process orientation.	Diagnosis of learner knowledge; product orientation.	Training of co-teachers, e.g., career changers and lateral entrants.	Provision of learnable 'knowledge bites' in the form of videos.
Teaching methods	For example, in 'conferences': 1) Production in small groups, 2) Reflection in large groups, 3) Discussion in plenary (Selter & Walter, 2020).	For example, as 'home videos' about homework, FERMI tasks, excursions, project work, individual research processes, etc.	For example, for explaining didactic principles, didactic of materials, enactives, etc.	For example, as videos for 'Flipped Classroom' (home time for watching videos, classroom time for discussions).
Workload	Initially high (especially if multiple takes with storyboards are planned), but significantly lowers when used repeatedly as learners become accustomed to processes.	Initially high, but significantly lowers when used repeatedly as learners become accustomed to processes.	Medium to high (additional effort for teachers due to video production).	Medium to high (additional effort for teachers due to video production).
Potentials	Not necessarily additional software needed, videos can be recorded directly with tablets; enhanced content comprehension; cross-grade and cross-school-type collaborations possible (Schacht et al. 2019); explanatory videos as part of learning portfolios.	Enabling individual learning at one's own pace and the diagnosis of learner knowledge (provided it was filmed at school and not at home).	Time-efficient preparation of content instead of individual explanations for each new colleague; guidance of new colleagues to improve teaching quality through the parallelization of material use, etc.	Time-efficient preparation of content that can be used, for example, for re-learning opportunities; opening up the possibility to use classroom time for reflections (in a 'flipped classroom' setting).
Obstacles	Time expenditure and material requirements (minimum requirement: a class set of tablets).	Time expenditure and potential disadvantage for learners from socioeconomically disadvantaged households.	Potentially suboptimal video production (e.g., due to errors in videos).	Passive consumption of videos by learners.

In Table 1, an overview of different formats of explanatory videos is provided with regard to possible didactic intentions, teaching methods, workload, potentials, as well as obstacles. Without claiming to be exhaustive, Table 1 illustrates how complex and versatile the use of explanatory videos in educational contexts can be.

From a didactic perspective, videos by learners for learners have proven to be particularly promising for fostering learning processes (Kunsteller, 2021; Kuzu, 2023c; Römer & Nührenbörger, 2018;), e.g., in the context of 'production conferences', in which learners produce videos in small groups and reflect in large groups with regard to the video improvement potential before tackling further takes in the small groups (Schreiber & Klose, 2017; Selter & Walter, 2020). According to the principle of 'learning by teaching' (Grzega & Schöner, 2008), learning is particularly successful, if a learner can explain, what he/ she has learned, and such an implementation of digital media would be more learner-centered as demanded in pedagogical research on the usage of digital media (Lingnau & Hoppe, 1994). Another important potential of (learner-)explanatory videos lies in the fact that it is a format with a low-threshold with regard to technical possibilities: Nearly every tablet has a video recording function and several possibilities to use apps for managing video takes (Bitzenbauer et al., 2023; Walter & Dexel, 2020).

Since the use of explanatory videos on site takes place under different conditions than in laboratory studies, the possibilities and limitations in practice must be weighed up here. Particularly with regard to the factors of time and the heterogeneous nature of learner groups (Kuzu, 2023d, 2023e). In this respect, teacher reflections (see section 2.2.) provide initial insights into the evaluation of the use of explanatory videos in school practice and offer interdisciplinary insights into reflection processes.

2.2. 'Reflections' and Learning Processes from a Constructivist Perspective

'Reflections' can be defined as *processes of cognitive structuring and re-structuring with the aim of further developing one's own knowledge, attitudes, and options for action in specific situations by linking these with one's own and others' ideas, ideally integrated into interactions* (Abendroth-Timmer, 2017; Dewey, 2000; Kuzu, 2023b; Neuweg, 2005; Prediger & Rösike, 2019; von Aufschnaiter et al., 2019). Thus, 'reflections' are a specific form of learning based on individual memories and ideas, therefore the importance of interactions is emphasized: Following the (socio-)constructivist paradigm, human learning processes are schemes that emerge intra-individually and encompass different nuances of meaning – so-called 'individual notions', e.g., relational mental models or schemata through which individuals can grasp the meaning of objects and phenomena in everyday and specific situations (Fischbein, 1989; Kuzu, 2023d) – , and they are constructed and constituted inter-individually, e.g., *in and through linguistic discourses between different subjects* (Gogus, 2012; Schneider et al., 2012; Waxer & Morton, 2012): 'Knowledge' is thus not axiomatic, but is negotiated interpretatively and through social interactions between subjects (Jungwirth, 2003; Krummheuer & Naujok, 1999; Nührenbörger & Steinbring, 2009; Schütte et al., 2019; Steinbring, 2006; Wilson, 1981).

Reflections can be differentiated into two central forms: *Retrospective* and *prospective reflections*. *Retrospective reflections* are understood to be reflections on the assessment/ evaluation of past and completed actions and *prospective reflections* are reflections related to the expansion of future options for action, e.g., with reference to expected teaching and learning needs. Both forms can occur in mixed types, for example when teachers reflect on their actions in the past and draw conclusions for their future actions (Aeppli & Lötscher, 2016; Cendon, 2017; Göbel & Gösch, 2019; Herzog, 1995; Prediger & Rösike, 2019; Scherer et al., 2020; Sherin & Drake, 2009). Reflections thus have an epistemic function: they primarily serve as subjective cognitive processes that relate to past or future actions and are a central activity of human life practice. Scherer et al. (2020) point out that the insights "*can be directed both towards one's own teaching actions (self-reflection) and, in the sense of external reflection, towards the actions of other teachers*" (Scherer et al., 2020, p. 435, translated by authors).

Reflections are closely related to so-called 'beliefs' – marked below by the code ||…|| – which can be understood as values and convictions and include, for example, self-efficacy beliefs, professional beliefs and general beliefs about teaching subjects and teaching-learning processes. Oser and Blömeke (2012) define 'beliefs' as convictions that "*(mostly) include non-scientific ideas about how something is or how something works, with the claim of validity for action*" (Oser & Blömeke, 2012, p. 415, translated by authors). Although the connection between 'beliefs' and reflection processes is often described in research, it has also been empirically indicated that the development of 'beliefs' is very difficult and does not succeed *automatically* through reflection and further training (Beswick, 2007; Bosse, 2017; Prediger & Rösike, 2019; Ratzke, 2021; Scherer et al., 2020).

From a psychological perspective, 'beliefs' are typical human thought processes that are closely interwoven with mental coherence formation – being similar or rather connected to the idea of 'frames' (see section 3.1) – , which do not occur singularly, but are part of so-called 'webs of beliefs' and can also consist of contradictory 'beliefs'[2] (Kirkham, 1992; Sosa, 1980; Zimring, 2019). 'Coherence' in the context of 'beliefs' refers to "*meaningful interconnections between distinct psychological entities. For example, a system of independent beliefs that is logically consistent from one belief to another would be described as coherent.*" (Van den Bos, 2015, p. 1). 'Beliefs' are thus a common phenomenon in human thought processes, and they can influence the agency of individuals, e.g., by turning into pathological patterns like the 'imposter syndrome', where beliefs of the type ||*I don't really deserve to be in this position/do this job*|| have a decisive negative influence on mental health, actions, and motivation (Clark et al., 2022).

3. Method

Both the primary school pedagogical and the Catholic religion education study reconstruct findings in planning and reflection processes (see section 2.2) by using a qualitative-explorative approach; the analyses aim to "explain and identify causes and backgrounds" (Prediger, 2019, p. 8; translated by authors). The explorative analyses are conducted using the interpretative methodology of Interaction analyses (Krummheuer & Naujok, 1999). Section 3.1 first introduces the analysis methodology and procedure before describing the different samples and the joint research question.

3.1. Interpretative Interaction Analyses

Since interactions in classroom contexts were examined in both studies, a sequential and interpretative analysis approach and methodology was chosen: The so-called Interaction analysis (Cobb & Bauersfeld, 1995; Jungwirth, 2003; Krummheuer & Naujok, 1999; Kuzu, 2023d; Maisano, 2019; Meyer, 2009; Tiedemann & Fetzer, 2018; Schütte et al., 2019). Thus, transcrips, planning documents/ texts in sequenced forms as well as memos located therein were analyzed interpretatively. These analyses were interpretative for two reasons: First, they did not claim to be reconstructions of 'truths' but hypothetical and possible explanations, and second, knowledge was considered as socially constituted and constructed in the interaction of subjects (see section 2.2). The interpretative Interaction analysis was conducted on three levels (see Figure 2): A) Ground/ Abduction level, B) Theorisation level and C) Comparative level. On the *abduction level*, multiple empirically grounded hypotheses were formulated extensively as well as sequentially per turn and discussed with other experts, researchers and teachers to ensure the highest possible degree of intersubjective plausibility through an extensive hypothesis formulation (hypothesis-discourse) (Schütte et al., 2019; Steinke, 2004). 'Abductions' can be understood as *assumptions* that emerge

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[2] An example of contradictory 'beliefs' in pedagogical practice would be when a teacher thinks ||*that he/she can support all learners in a competence-oriented way and build on their individual resources/ previous experiences*||, but at the same time develops a deficit-oriented view of multilingual learners through ideas such as ||*Multilinguals are 'languageless' learners with no competencies, they should only learn the official/ state language and should not speak their home languages in the school context*|| (see Garcia & Wei, 2014; Kuzu, 2019, 2023; Moschkovich, 2010).

from within the data and help the observers/ interpreters in arranging and ordering the observed phenomena in a Peircean sense (Meyer, 2010; Paavola, 2011):

„*A mass of facts is before us. We go through them. […] But suddenly, while we are poring over our digest of the facts and are endeavouring to set them into order, it occurs to us that if we were to assume something to be true that we do not know to be true, these facts would arrange themselves luminously. That is abduction. [...] Abduction is the process of forming an explanatory hypothesis.*" (Peirce, 1903, EP II, pp. 531f.; CP 5.171)

After several turns of abductive interpretations in teams, so-called 'Deutungshypothesen' might emerge, meaning hardened/ focused hypotheses which can be chosen from the multiple hypotheses that were formulated in the prior turns (if possible), e.g., when conflicting hypotheses emerged and the further course of the sequence gives indications on which of those hypotheses seems more viable/ grounded (Jungwirth, 2003). Thus, 'Deutungshypothesen' are hypotheses, that give/ allow "*a particularly comprehensive understanding and appear to be particularly insightful for the research question*" (Jungwirth, 2003, p. 194, translated by authors).

On the *theorisation level*, the 'Deutungshypothesen' are further enriched, compared and synthesized with existing theoretical frameworks or other professional forms of knowledge with regard to the observed phenomena (Meyer, 2010; Schütte et al., 2019). E.g., when a specific individual notion of interpreting fractions could be reconstructed abductively, it might be a 'smaller piece' in a bigger context, a further notion in an existing model or theory of fraction-interpretation models (Kuzu, 2023d). These theoretised hypotheses about learning processes, interaction patterns, etc. are at the same time so-called 'local theories', meaning learning- and interaction-related as well as subject-specific insights into processes, aspects, and facets of how individuals interpret specific objects – according to their 'frames', meaning forms of *pre-knowledge of individuals that organizes thoughts and makes them plausible by being definitions of or expectations with regard to situations* (Goffman, 1974), e.g., the 'cultural frame' as a form of pre-knowledge through which meaning is shaped and influenced by prior social and cultural experiences (Goffmann, 1974; Pavlenko, 2011) – that were reconstructable in the interaction sequences, with the knowledge-construction as well as -constitution process being understood as a rather social than individual process (Brandt & Krummheuer, 2000; Cobb & Bauersfeld, 1995; DiSessa & Cobb, 2004; Gravemeijer & Cobb, 2006). In a final step, the occurrence of similar or different 'Deutungshypothesen' in all groups was compared with the aim of "*representing the specificity of* [...] *segment*[s] *of reality* [...] *in their relationship to each other*" (Schütte et al., 2019, p. 125), thus a comparation and analytical broadening process followed upon the prior abductions and (early) theorisations (Bauersfeld et al., 1988; Brandt & Krummheuer, 2000; Schütte et al., 2019). Brandt and Krummheuer (2000) describe the importance of making such comparisons and broadening the analysis for a) claiming the (high) impact or generalizability of the observed phenomenon and of the developed theory and b) for documenting the intractability and complexity of the reality which shall be made understandable through the developed theory (Brandt & Krummheuer, 2000), thus for assessing the 'conceptual representativeness' (Strauss & Corbin, 1990) of the interpretations prior to the (final) theoretisation step: "*We need to compare with interpretations of other classroom excerpts to even understand a single scene or episode with the claim of a certain theoretical saturation. This is naturally a mutually enriching process in terms of the excerpts selected for comparison.*" (Brandt & Krummheuer, 2000, p. 223, translated by authors; see Glaser & Strauss, 1967).

In Figure 2, the method of interpretative Interaction analysis is visualized with references to further theoretical backgrounds of the method (see terminological background, roots/ similar methods, etc.). For example, the analysis technique of asking specific questions in between turns, such as 'Why that now?' and 'What's next?', or the analytical attempt of 'de-indexicalizing', meaning hypotheses about implicit facets in utterances and utterance parts "*whose sense cannot be decided by an auditor without his necessarily knowing or assuming something about the biography and the purposes of the user of the expression, the circumstances of the utterance, the previous course of the*

Figure 2

The framework of the Interpretative Interaction Analysis (Source: Authors' own elaboration)

Interpretative Interaction Analysis – An Extended Overview of the Method and the Terminological Background

Repetition of steps until 'theoretical saturation' is reached/ can be assumed (see Glaser & Strauss, 1967)

Comparation level

- Comparison of *similar* hardened hypotheses and cases with regard to nuanced differences between them
- Comparison of *different* hardened hypotheses and cases to gain a wholistic understanding of the phenomena

"…to depict the specificity of […] segment[s] of reality […] in their relation to each other." (Schütte, Friesen & Jung, 2019, p.125)

Theorisation level

- Choosing of hardened hypotheses and synthetisation with existing theoretical aspects/ backgrounds

"… [theoretical] deduction […] can be used to verify ideas that have been gained abductively. " (Meyer, 2010, p.186)
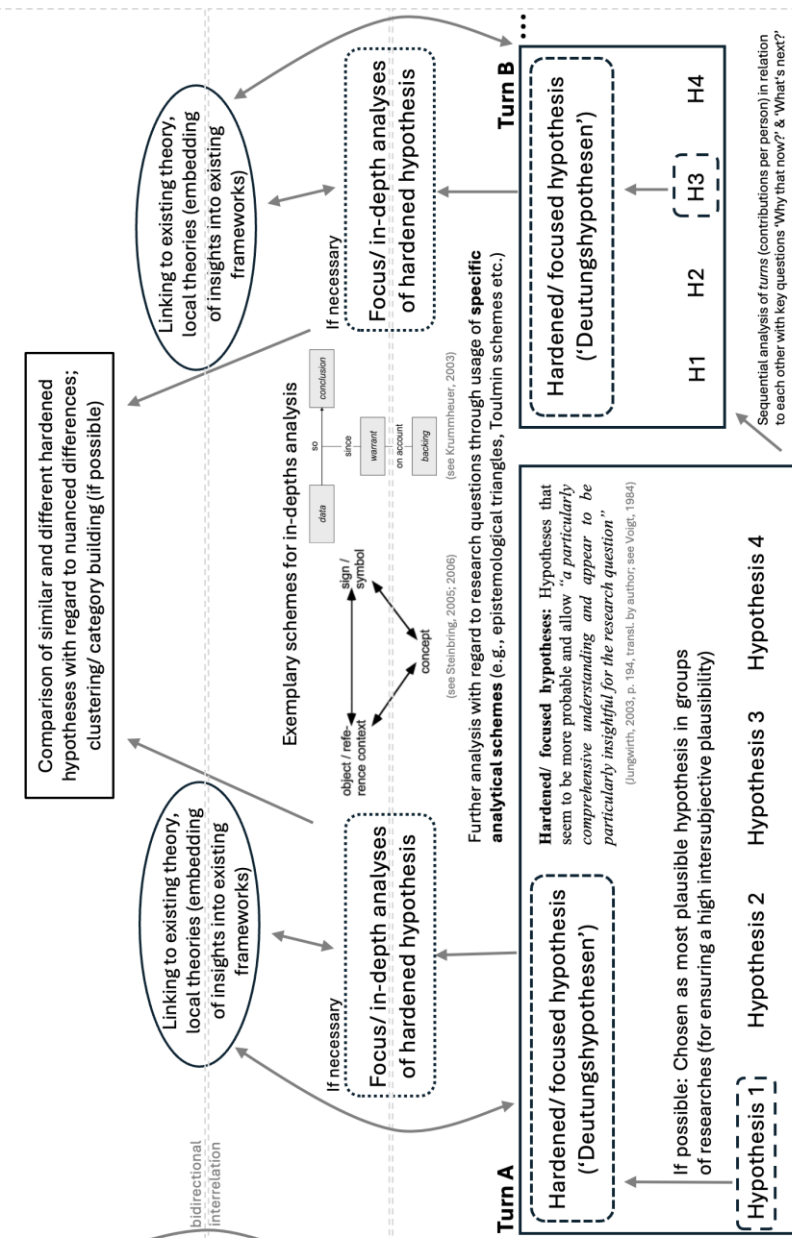
Ground/ abduction level

- Strictly abductive and sequential turn-by-turn analysis, extensive formulation of as many hypotheses as possible per turn regarding interaction processes, patterns and conceptual interpretations
- Hypothesis formulation per turn in teams of researchers, experts, teachers etc. for intersubjective plausibility
- Ideally, interaction data from classroom/ everyday contexts instead of Interview-settings

"A mass of facts is before us. We go through them. […] But suddenly, while we are poring over our digest of the facts and are endeavouring to set them into order, it occurs to us that if we were to assume something to be true that we do not know to be true, these facts would arrange themselves luminously. That is abduction." (Peirce, 1903, EP II, pp. 531f.)

Comparison of similar and different hardened hypotheses with regard to nuanced differences; clustering/ category building (if possible)

Linking to existing theory, local theories (embedding of insights into existing frameworks)

If necessary

Focus/ in-depth analyses of hardened hypothesis

Turn B

Hardened/ focused hypothesis ('Deutungshypothesen')

H1   H2   H3   H4

Exemplary schemes for in-depths analysis (see Krummheuer, 2003)

conclusion
data   so
since   warrant
on account
backing
sign / symbol
concept
object / reference context (see Steinbring, 2005; 2006)

Further analysis with regard to research questions through usage of **specific analytical schemes** (e.g., epistemological triangles, Toulmin schemes etc.)

Hardened/ focused hypotheses: Hypotheses that seem to be more probable and allow *"a particularly comprehensive understanding and appear to be particularly insightful for the research question"* (Jungwirth, 2003, p. 194, transl. by author; see Voigt, 1984)

Linking to existing theory, local theories (embedding of insights into existing frameworks)

If necessary

Focus/ in-depth analyses of hardened hypothesis

Turn A

Hardened/ focused hypothesis ('Deutungshypothesen')

If possible: Chosen as most plausible hypothesis in groups of researchers (for ensuring a high intersubjective plausibility)

Hypothesis 1   Hypothesis 2   Hypothesis 3   Hypothesis 4

bidirectional interrelation

(see, e.g., Bauersfeld, 1980; Krummheuer, 1982; Krummheuer & Voigt, 1991; Cobb & Bauersfeld, 1995; Brandt & Krummheuer, 2000; Voigt, 1984; Jungwirth, 2003; Steinbring, 2005)

Sequential analysis of turns (contributions per person) in relation to each other with key questions 'Why that now?' & 'What's next?'

Roots/ similar methods:

- Symbolic interactionism
- Ethnomethodolgy/ Conversation analysis
- Objective Hermeneutics
- Grounded Theory
- Constructivism/ Situated learning theory

(see Garfinkel, 1967; Glaser & Strauss, 1967; Blumer, 1969; Piaget, 1977; Oevermann et al., 1987; Lave & Wenger, 1991; Sacks, 1992)

Terminological background:

Interpretative paradigm/ worldview: In contrast to axiomatic and normative knowledge forms in science, in humanities, interpretations of human thoughts and implicit knowledge can only be inferred hypothetically and human knowledge is constructed in interactions, depending on subjective interpretations that emerge through so-called "frames' ("Rahmungen"), being forms of pre-knowledge that organize thoughts and make them plausible, and differences in 'frames' might lead to negotiations ("Bedeutungsaushandlungen") between subjects.

(see Schütz, 1971; Goffmann, 1974; Wilson, 1980; Krummheuer, 1982; Cobb & Bauersfeld, 1995; Jungwirth, 2003; Rosenthal, 2018)

Criteria of analytical depth and viability:

1. Intersubjective plausibility of hypotheses (via discussion in teams)
2. Extensive hypothesis-generation (as many hypotheses as possible)
3. Hypothesis-discourse in groups of researchers (discussion and marking of more probable hypotheses/ 'Deutungshypothesen')
4. Empirical grounding of hypotheses (via turn references)

(see Cobb & Bauersfeld, 1995; Jungwirth, 2003; Steinke, 2004; Rosenthal, 2018; Schütte et al., 2019)

conversation, or the particular relationship of actual or potential interaction that exists between the expressor and the auditor" (see Garfinkel 1967, p. 4-5), are crucial aspects of the sequential analysis and stem from methodologies and methods such as Ethnomethodology/ Conversation analysis or Objective Hermeneutics (see Figure 2). The method of Interaction analysis is often used in didactical contexts for the reconstruction of conceptual knowledge, interaction patterns, etc., but it can be used for the analysis of every interaction process, as the fictive example in Figure 3 shows (see Figure 3).

Figure 3
A ficitive example for the interpretative Interaction analysis
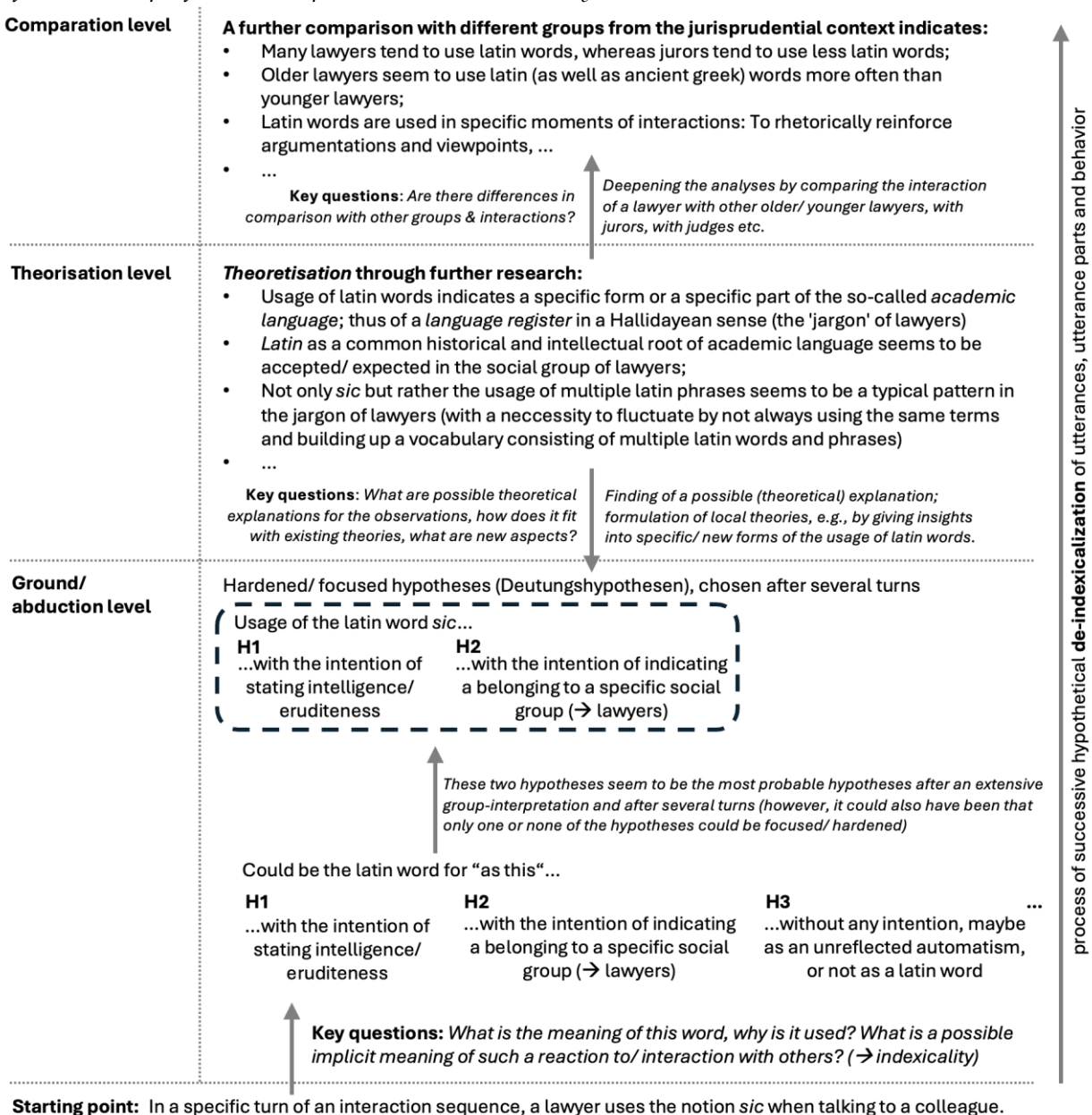
In Figure 3, just one word from a turn (the latin word "sic") is analyzed on all three levels to illustrate the complex process of explaining via hypotheses and enrichening explanations by linking them to existing theories and deepening them through comparisons.

In this article, mainly insights into abduction processes will be given due to space restrictions. Since this article follows a joint research question from a highly interdisciplinary perspective (see section 3.4), a comparison will be made between the subject-specific analyses (section 4.1 and 4.2) in the conclusions (see section 5).

3.2. Sample and Research context of the Primary School Pedagogical Study

The broader research context of the primary school pedagogical study is the analysis of primary school learners' mathematical learning processes: Pre-algebraic thinking processes in the context of the 'Auxiliary task' are analyzed. The 'Auxiliary task' is a mental calculation strategy which is based on the law of constancy, where students learn that tasks like 193 – 38 can be modified by rounding-up or -down numbers (e.g., 38 to 40), if the modification is compensated adequately at the end (Kuzu, 2022a; 2022b; 2023a). In three main cycles in 2020, 2021 and 2022, n = 18 3rd to 6th grade learners (9–12 years old) were supported in a self-developed teaching-learning environment in accordance with the principles of Design-based Research (Prediger, 2019): Iteratively, different variants and adaptations of the self-developed teaching-and-learning environment were tested by trained and prospective teachers as being part of their teaching practice and after each iteration, the design-principles (meaning theory-based and empirically substantiated maxims for designing the learning environment) as well as design-elements (meaning the concrete tasks, manipulatives, etc. being used in the learning environment according to the design principles) were adapted (Kuzu, 2019; Prediger, 2019). The implementations also included the production of learner explanatory videos after the third cycle: the learners produced multiple explanatory videos for the 'Auxiliary task' after conceptually reflecting the strategy (Kuzu, 2023c, 2024). For producing the explanatory videos, the learners could use a storyboard, which captured the steps of the video production, important language means and the role division between the learners (see Figure 4).

Figure 4
Storyboard-template from the learning environment

Note. Translated and adapted from Kunsteller (2022).

Using a storyboard as in Figure 4 is important for helping learners structure their planning process and to support them in improving their explanations between the takes (Kunsteller, 2022; Leiningen, 2020). Schreiber and Klose (2017) suggest an iterative production process following the steps 1. Unexpected Recording (pilot take), 2. Script/ Storyboard (first version), 3. First take, 4. Editorial Meeting/ Conference, 5. Script/ Storyboard (second/ final version) and 6. Final take, since such an iterative approach to the production of digital media significantly improves the quality of learners' explanations (Schreiber & Klose, 2017). Furthermore, in the storyboard used in the learning environment, a content-and-language-sensitive approach was implemented by letting the students a) collect important language means for explanations and b) use their home languages for activating their multilingual resources (Kuzu, 2023d). In the tip above the language means box

(right side of Figure 4), the usage of AI-Systems like ChatGPT was also permitted for, e.g., translating between languages (see Figure 4) since prior analyzes indicated that the usage of AI systems can be highly fruitful for the ad hoc activation of multilingual resources and translations (Kuzu, 2024b; Ray, 2023). Overall, the software and digital media, which was used in the learning environment, consisted of a) the materials (storyboard, worksheet, enactives, etc.), b) tablets, c) the standard video recording function of the tablets (for the first takes) and later also d) specific software for producing and arranging complex videos[3].

In addition to the implementation of explanatory videos, the teachers had the task of reflecting the explanatory video production process as well as the conceptual development of the learners, with a focus on the *languaging* processes (Garcia & Wei, 2014; Swain, 1985): they were first asked to conduct and film the lesson and then, immediately after the implementation, to write down so-called 'memos' when viewing the session videos (Kuzu, 2023b). After recording the video, the teachers watched the recorded videos and stopped at scenes where they felt something interessting happend; they were asked to comment on the process in form of memos or reflection notes. The question asked was: "*Were there any scenes where you felt that a) the production process of the explanatory video was viable or non-viable and b) the student's used language in a way that differed from your expectations? How and why did you react the way you did?*"

In the sequence analyzed in this article, a pair of students in a mixed-age group (S6 is 12 years old; S7 is 9 years old) were asked to create an explanatory video about their understanding of the 'Auxiliary task'. The teacher – the main research subject in this article (n = 6 teachers were researched in the study) – was male, 35 years old and had five years of teaching experience. He has the same multilingual background as the students (German-Turkish).

3.3. Sample and Research context of the Catholic Religion Education Study

The Catholic religion education study focuses on the reflection and production of explanatory videos on the topic of interreligious education among prospective Catholic religion education teachers in the higher education sector. The sample consists of n = 17 prospective teachers. Of these, n = 14 prospective teachers are studying 'Catholic theology as a secondary school teacher' and n = 3 prospective teachers study the BA 'Humanities'. The latter are part of the sample in order to be able to address the reflections of non-denominational teachers within the cohort. The students are in the higher BA semester. The sample building process was according to standards in Social and Human Sciences (Döring & Bortz, 2016).

The project described here, entitled "Interreligious learning through explanatory videos", was conducted in the winter semester 2022 / 2023 at the RWTH Aachen University and aims at providing insights into how prospective religion teachers a) deal with diversity in order to consider the potential of a pluralistic society based on the learning by focusing subjects (Boschki, 2017; Grümme, 2007;) and b) use explanation videos in this process. Further data collection was carried out in October 2022, January 2023, February 2023 and June 2023.

The content of the project "Interreligious learning through explanatory videos" was a) encounters in interreligious teaching (three units à 90 minutes) and visiting a mosque (one visit for 120 minutes), b) reflections on Catholic religion education when working with explanatory videos in Catholic religion education lessons (with the subgoals 'diversity sensitive language in the video' and ' diversity sensitive pictures in the video' (both: three units à 90 minutes)), c) the technical production of explanatory videos (with the question of how to use a specific video software to produce an explanatory video (five units à 90 minutes) and d) the presentation and reflection of produced explanatory videos in an interreligious learning space (two units à 90 minutes).

The group discussion was used to collect data with the aim of recording dynamic group learning processes (Döring & Bortz, 2016). The audio data collected was transcribed and

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[3] Due to legal reasons, the name of the software is not mentioned but the students could take videos, cut videos and combine them with audiographed parts. Before starting the explanatory videos, the software functions were explained profoundly.

interpreted in interdisciplinary groups. This methodological approach was able to ensure a greater interpretative depth structure than would have been possible using, e.g., a questionnaire survey (Lamnek & Krell, 2016). The analysis is ongoing, and group discussions as well as video scripts were analyzed. In this article, especially the video scripts of (fictive) interactions will be focused.

3.4. Joint Research Question

The following research question is focussed on across both projects, which arises from the theoretical status and the research gap outlined in section 2.1 on the one hand and from the professional relevance for both sub-disciplines, for mathematics and Catholic religion education, on the other:

Q1) What individual reflection processes can be reconstructed for teachers and prospective teachers who have experience in using explanatory videos in the classroom?

Q2) Which potentials and obstacles for the use of explanatory videos can be reconstructed in the context of the production of explanatory videos?

4. Empirical Insights: Teacher Reflections on Explanatory Videos

The interpretative analyses on the use of and reflection on explanatory videos following the analysis method of Interaction analysis (see section 3.1) are first presented separately and then linked by a comparative discussion (see section 5). Since the research approach in both studies was qualitative but differed in the use of subject-specific content and the producers (students and teachers), a carefully conducted and extensive interpretative analysis approach was necessary for obtaining interdisciplinary findings on the use of explanatory videos (Schütte et al., 2019). For making the turn-by-turn analysis visible, the succession process is marked by <u>underlining</u> the new turns being focused chronologically.

4.1. Reflections on Explanatory Videos in the context of the Primary School Pedagogical Study

In the following, a sequence from the primary school pedagogical study is presented (see Table 2) and analyzed abductively. In a first step, the interactions between the learners and the teacher are focused and in a second step, the teacher's reflection memos, being embedded into the transcript, are interpreted in the context of these analyses.

At the beginning of the sequence, learners S6 and S7 produced an explanatory video on the mental calculation strategy of the 'Auxiliary task' (see section 3.2). The context of the production process is the production of explanatory videos from learners for learners (see Table 1) but the teacher can observe the production process and watch the videos, too. It is an age-mixed and multilingual group of learners (German-Turkish): S6 is 12 years old and S7 is 9 years old. The mathematical task which the learners had to explain by using/ constructing an 'Auxiliary task' was 156 – 28. The explanations are analogous to the conceptual representation in the learning environment, e.g., the learners use cardinal materials (so-called 'Dienes materials', e.g., hundreds plates, tens bars and units cubes) to set the task and to represent the modification and compensation using the cubes added and removed again (see Kuzu, 2022a, 2023a). To do this, the learners placed a white poster on the table so that only the poster with the objects on it is visible during the video take and the learners' voice comes from the 'off' (from the background). At the time of the transcription excerpt, the learners have already produced three videos on this topic; it is an excerpt immediately before the fourth take. The teacher, who interacts with the learners in this sequence, is also the teacher who added his memos to the sequence immediately after the session and these memos are inserted at exactly the points where he stopped the video and made the memos.

The sequence begins with the learners' third explanatory video in <u>turn 80</u>; they had previously produced two other videos (the first was cancelled by the learners after a few seconds because the speaking and executive learner had made a mistake and seemed a little excited; the second video was produced in German and was similar in content, although a more in-depth analysis shows

Table 2

Transcript sequence from the primary school pedagogical study

		Transcript (in gray the Turkish parts of the statement and its translation)
80	S6	Hoşbulduk bize(m) matematik video (Welcome to our maths video), bugün göstercez nasıl (today we will show how the) trick, bu (this) our task *[points to the poster]*, biz ba başlıyos yüz elli altı uh aksı(ğ), uh eksik yirmi sekiz (we start at one hundred and fifty-six uh missing(d)/ minus, uh missing twenty-eight), eh, ama bu çok ağır (but that's too hard), şimdik biz yirmi sekize iki artı yapıyoz (now we add twenty-eight two/ plus), ehm, otuz oluyo (that will be thirty), şimdi biz yüz elli- yüz elli altı, ähm aksı(ğ) otuz yapıyoz (now we make one hundred and fifty-one hundred and fifty-six missing(d)/ minus thirty) *[pushes away two tens from the cardinal set 156 on the left and also the 28 + 2 on the right]* bu yüz yirmi altı yapıyo (that makes one hundred and twenty-six) *[points to the remaining cardinal set 136]* but bu yanlış (that's wrong) because we have to iki artı yapcaz (we add two/plus) [points *briefly to the post-it where there were two before, then he adds two more]*, bu (that) uh, yüz yirmi sekiz yapıyo (that makes one hundred and twenty-eight). Teşkür- küm, teşkelüm- (thank you, thank you, thank you-) Yes.

[Learners watch the video directly after shooting]

81	Leh	Süper, süpersin! (Great, you're great) Look, really super/ great *[signalling the 'thumbs up' gesture with both hands]* Shall we look at that again, together?
		Reflection memo 1: *To be honest, I was a bit confused at this point because I didn't expect them to produce such exciting videos. They were usually the 'quiet types' I'd say, and they didn't talk that much, I usually had to pull out all the explanations from their noses, but when they started planning and shooting these videos they started talking a lot and especially talking about the task. That's why I thought it was so important to praise them at this point.*
82	S6	Yes *[the learners now start to watch the video]*.
83	Leh	So look, you've managed to do it almost completely in Turkish, I think that's really great.
84	S7	I have a remark, here are thirty *[points to the cardinal objects visible on the table, there is still one too many tens-bar in the quantity for the number 126]* not twenty.
85	Leh	Hmm *[looks irritated]* Let's have another look, maybe we can do it again *[holds the tablet in his hand and plays the learner's explanatory video again]* It's really good *[makes the 'thumbs up' gesture again]* Look how clearly you speak, it's veeery easy to understand. Shall we finish watching or do it again?
		Reflection memo 2: *I was totally surprised, the explanation in the video was correct, but there was still a tens-bar too much on the table. I thought it was great that he had seen that! It wasn't his turn to shoot the video yet, the learners always took turns, but yet he paid attention.*
86	S6	Finish watching *[S6 now picks up the tablet and looks at it carefully]*
87	Leh	It's a great idea, isn't it *[looks at the learners as they change the objects on the table to match the task, e.g., again placing the numbers 156 and 28 with hundred plates, tens bars and units cubes]*

important differences with regard to linguistic condensation processes, see Kuzu, 2024a). In the sequence shown here, the learners S6 and S7 now produce a multilingual explanatory video for the first time, with S6 taking on the executive role (in later sequences, the learners will switch the roles). For the most part, the learners planned the explanatory videos independently and in role-switching interaction with each other – one learner was usually the 'cameraman', the other learner was the 'explainer' (see storyboard, Figure 4), but the content was planned and revised by both learners – and the teacher had a passive role in order to allow the unforced activation of multilingual resources and the use of the learners' own language resources (Kuzu, 2023b, 2023d). The explanation in turn 80 tends to be an explaining-HOW (see section 2.1), as learner S6 explains the procedure: he points out that the initial term is "too hard" ("bu çok ağır", see turn 80), being the reason for the rounding up, which he explains in the next step with the language means "yirmi

sekize iki artı yapıyoz" (translated: "now we add twenty-eight two/ plus", see turn 80). He then mentions the interim result/ term ("şimdi bis yüz elli- yüz elli altı, um, aksı(ğ) otuz yapıyoz", translated "now we make one hundred and fifty- one hundred and fifty-six miss(ing)/ minus thirty", see turn 80). In a final step, S6 explains that he now has to compensate, e.g., subtract the rounded up "two" from the interim result/ term ("but bu yanlış, because we have to iki artı yapcaz", translated as "but that's wrong, because we have to add two/ plus", see turn 80). Even though the explanation here tends to appear procedural, first facets of a conceptual explanation – of an explanation-WHY – also become assumable, as S6 not only uses symbolic language means but also cardinal manipulatives (cubes, bars, and plates) accompanied by domain-specific language means (Bauersfeld 1983; Kuzu, 2019, 2022b, 2022e), for example when expressing cardinal actions by using language means such as "take away…" and "add…" (see turn 80). In this conceptually illustrated explanation, thus first conceptual aspects behind the procedure in the sense of so-called 'procepts', being an "*amalgam of both process and concept, [...] the manifestation of the process itself, which can be manipulated as a mental object*" (Gray & Tall 1992, p. 210), are interpretable. An important aspect from a linguistic perspective is the dialect: learner S6 shows an Aegean dialect (being confirmed by a self-disclosure of S6), as he does not pronounce "eksi" but "aksığ" (see turn 80).

Immediately after turn 80, the learners begin to watch the video and in turn 81, the teacher praises the learners very expressively: He emphasizes that the learners are "super" and says that it is "really great" (see turn 81) what the learners have produced, either the explanation or the explanatory video (cannot be conclusively determined in turn 81). However, at this point he writes down a first reflection memo while watching the video of the sequence. His reflection memo provides insights into retrospective reflection processes because in retrospect (watching the video after his lesson), he verbalizes his assessment of the situation as well as his surprise in the situation: He says that he was "confused" (see turn 81) by the successful explanations of the learners, which allows assuming that he might have had low competence attribution in advance with regard to the learners' competencies, capabilities and performances. The low attribution of competence seems to be related to two aspects, a) the production of the explanatory video and b) the learners' linguistic performance or competence since the teacher mentions the "production of the video" as well as the learners being normally "the quiet types" in the same memo. This latter is confirmed in the further course of the memo, as the teacher also points out that the learners "didn't talk that much" and that he often had to "pull out all the explanations out of their noses", an idiomatic phrase in German for emphasizing the high effort in motivating someone to talk (see turn 81). However, the fact that the learners were then – to his surprise – able to verbalize so much, moreover with a high degree of task relevance, seems to be a reason for the effusive praise. At this point, however, it could also be that the teacher is 'defending himself' in the presence of the researcher – the reflection memo could therefore be aimed at *influencing (the researcher) through a subtly judgmental positioning and presentation of information* (here: of his own actions or intentions), which is also referred to as 'framing' in the psychological literature (Beyer & Gerlach, 2011, p.153), a term being linked to Goffman's (1974) notion of 'frame' insofar as it adds the notion of influencing the 'frame' of somebody else according to a manipulative 'frame' that is set on purpose (see section 3.1) – because he might suspect or fear possible criticism of his excessive praise or his guidance of learners, knowing that the memos will be analyzed by researchers afterward (which he was also told in the course of obtaining consent). It also becomes visible in the memo that he seems to focus less on the content and more on the linguistic aspects at this point, whereby the linguistic aspects are also part of the subject- and language-sensitive design of explanatory videos (see section 2.1). Thus, at this point, the belief ||*learners with low language performance are not so well able to produce (language-heavy) explanations*|| can be assumed in turn 81 as well as memo 1. It is also important to mention that the teacher signals *surprise* in memo 1 since the learners act very actively and produce language contrary to his possible belief and expectations. However, this does not mean that his belief changes, but this could be a first significant 'disruptive moment' with

regard to the sustainability of his belief. In a later sequence – not shown here in this sequence – it will be confirmed that he is questioning his own beliefs because a little later (in turn 102, not visible here), he writes down the following memo:

Reflection memo 5: *I think I will have these two create more explanatory videos in the future. It has so many advantages: they can watch it again and again and remember it if they forget, and it also promotes their language production and their better understanding of the math task, e.g., the mental calculation strategy here. And these two, quite honestly, I thought they were linguistically weak and wouldn't be able to do it, but they really surprised me.*

Reflection memo 5 shows that, on the one hand, he sees a potential for content-and-language integrated support in the use of explanatory videos in the sense of the pushed-output hypothesis (Swain, 1985), meaning that a) multiple written or oral opportunities for the production of language and b) the cognitive processes being involved in these production processes are key factors for *learning of and through language* (being so-called *languaging-processes* according Swain, 1985), which is being reconstructible in the memo through the utterance part "it also promotes their language production and their better understanding of the math task, e.g., the mental calculation strategy here", and, on the other hand, he emphasizes that it is a memory-supporting form of production ("can watch it again and again and remember it"). At the same time, he again admits that he thought in advance that the two learners "would be *linguistically weak and* [...] wouldn'*t be able to do it*". This confirms the assumption that the teacher actively questions his initial, deficit-orientated belief after accompanying the use of multilingual explanatory videos as he admits that the learners "really surprised" him. It remains unclear whether this is a local or general belief change: it is possible that he is only revising his belief for this group of learners, but not in general (e.g., he could continue to focus strongly on language performance as an indicator of competence attribution) (see section 2.2).

Turn 82 then continues with a brief confirmation from the learner ("Yes"), presumably as an answer to the question in turn 81 ("Do we want to watch the video?") because the video is then watched again. In turn 83, however, the teacher does not respond directly to the learner's agreement to watch the video but continues his praise from turn 81: This time he praises the fact that the learner was able to speak so much Turkish. It can be assumed that he does this because – as he states (Kuzu, 2023b) – the learners did not have Turkish lessons at school and had not been socialized to speak Turkish at school (it rather was forbidden), which is why the use of Turkish is subject to higher obstacles than the use of German in educational institutions (Backus, 2013). However, he 'marks' the use of Turkish very strongly, not as an 'undesirable language' but as a 'particularly desirable language' ("almost completely in Turkish, I think that's really great ", see turn 83). According to Myers-Scotton (2006), 'marking' refers to any process of emphasizing, not just negative marking, it means the emergence of "*social ripples because participants* [do not wish or] *expect* [...] *a choice*" (Myers-Scotton, 2006, p. 159). However, marking the use of Turkish at this point does not contradict the competence-oriented view of multilingualism, as Turkish tends to be the sanctioned language in the school system, so that a kind of 'compensatory praise' is initiated here and such an awareness for valuation-imbalances combined with the will to compensate it, e.g., through praise, is an important factor in creating spaces for the activation of multilingualism (Garcia & Wei, 2014; Kuzu, 2023d).

In turn 84, S7 then speaks up for the first time and remarks that one tens bar is laid out too much, as the visible cardinal quantity is 136 and not 126 (as it should have been if the calculation was done correctly). This indicates that he actively listened and watched during the S6' enaction process and now wants to initiate a correction, presumably for the next take. In turn 85, the teacher also notices this and seems surprised again ("Hmm", see turn 85), although it is not entirely clear at this point whether he is possibly disgruntled or embarrassed for not seeing the mistake. He wants to "look again" (see turn 85) and points out that you could then make another take, presumably to point out that mistakes are not so bad. This could indicate a constructive-pedagogical view of mistakes as being part of a learning process (Oser et al., 1999; Türling, 2014) or a reaction to a

possible 'loss of face' – whereby 'face' in the sociological sense is understood as "*an image of self delineated in terms of approved social attributes*" (Goffman 1967, p. 5), thus as the self-conceptualization of an individual that is based on a moral and honor-related perception of integrity and is often protected in discourses by authoritarian actions and processes (Goffman 1967; Eriksson et al., 2016) – because, despite the errors, he had a) praised the explanation repeatedly and effusively in advance (see turn 81 and 83) and b) he is the teacher and thus a person, who might not want to make such mistakes in front of the learners. It is possible that the teacher perceives his assessment competence as being questioned here because teachers are generally not allowed to make any or only a few, or rather not too serious mistakes according to most 'didactic contracts' (Brousseau et al., 2014). This would explain his authoritarian and defensive behavior – e.g., his seemingly thoughtful comment with "Hmm" and his instructive tone of voice ("Let's have another look, maybe we can do it again") – but it is more of a 'soft' reaction and not (very) authoritarian, especially since he refers back to the video relatively quickly and now praises the learners again, possibly as a consciously defiant reaction to the naming of the mistake, especially since the praise now sounds differently nuanced: He now praises above all the clarity of pronunciation and that it can be understood "veeeeeeery easy" (see turn 85). He then asks the learners whether "we finish watching or do it again", which on the one hand is an inclusive 'we-message' and thus marks the learners and teacher as being part of the same social group and on the other hand provides a choice option so that it contrasts the (authoritarian) reaction in the previous sentence by leaving the decision to the group (and not only to the teacher), although this could also be a pretended freedom of choice at this point. He now adds a second reflection memo at this point, which confirms that he appeared surprised at the "Hmm" ("I was totally surprised", see reflection memo 2), and he also emphasizes positively that he thought it was good that S6 took part, thought along and saw that "there was still a tens-bar too much on the table ", which could also mean that he possibly assumed that S6 was not actively listening at this point of interaction (see reflection memo 2). The fact that he praises S6 afterward for being so attentive and having noticed that (see reflection memo 2) also contradicts the assumption of loss of face, at least it does not appear to be perceived as very important at this point, as the teacher is focusing on student participation rather than the perception of his person or competence (but, again, it is important to note that he might also be well aware of the fact that the researcher will analyze his memos so that he might not be fully honest or might be 'framing' the process in a way that he appears in a 'positive' light). In <u>turn 86</u>, S6 then wants to finish watching and the teacher allows this, so that the selection option in turn 85 was not a 'fake offer' but seems to be meant seriously. In <u>turn 87</u>, the teacher now praises the learners for preparing the next video take. An alternative hypothesis would be that he rather praises the usage of manipulatives as a good idea since he simultaneously looks at the manipulatives on the table, referring subtly and appreciatively to the correction of the mistake from turn 84, which is now part of the new laying-down process (see turn 87).

In summary, it can be stated that a highly process-oriented, strongly interactional discourse takes place in the sequence from turn 80 to 87, in which the teacher, S6 and S7 actively participate and in which S6 and S7 provide insights into their explanatory video planning processes: they plan and optimize the video take by correcting mistakes (see turn 84) and analyzing the videos shot in the run-up to a new take (see turns 82 and 86). Further findings also emerge with regard to the teacher's actions and reflections: He seems to make greater use of 'praise' to motivate and stimulate learners, although this is ambivalent from a pedagogical-psychological perspective: in the worst case, 'praise' binds the learners to an extrinsic source of motivation and may destroy the learners' intrinsic motivation (Siegler et al., 2021, pp. 378-380). However, both, the reflection memos and the teacher statements and actions, indicate that he approves of the production of explanatory videos and seems positively surprised by the processes (see reflection memo 1, 2 and 5). With regard to research question Q1, it can be reconstructed that the teacher in this sequence probably had no previous experience with explanatory videos and is using them for the first time (this is also confirmed by a self-disclosure from the teacher), but at the same time, he seems to see

specific advantages of an explanatory video production: On the one hand, the linguistic activation of learners who are assessed as being less active linguistically (see reflection memo 1) and, on the other hand, the high degree of activation of *both* learners, although he had assumed a rather one-sided activation (see reflection memo 2, turn 85 and 87). With regard to research question Q2, it could be reconstructed that after the lesson and when re-watching the interaction sequence, the teacher seems to be convinced that there is a high potential for stimulating linguistically weaker or less motivated learners, although it is important to note that the motivation process could also be highly dependent on the teacher's strong praise behavior (see turn 81 and 83). However, the teacher identifies an important potential of producing explanatory videos with regard to the activation of multilingual resources, as he explicitly praises a) the production in a multilingual way, e.g., by using German and Turkish in mixed-utterances, and also emphasizes b) the content-related focus of the activation of multilingualism (see reflection memo 1).

4.2. Reflections on Teacher Explanatory Videos in the context of Catholic Religion Education

In the following, a script-sequence is presented and will be analyzed interpretatively (see Table 3; section 3.1.1). It is a script in form of a transcript – thus a sequenced text – which the prospective religion teachers Sophie, Eva, and Susanne planned and discussed for making an explanatory video (vignette) they intend to use in year 10 classes of Catholic religion education as an 'encounter' impulse for students; thus, it is an explanatory video which is being produced by teachers for students (see Table 1). In a religion educational sense, 'encounter' means the empathy-based and ambiguity-tolerant approach of the individuals from one religious group to another religious or non-religious group and for that purpose, authentic impulses are an important element (Bauer, 2011; Ratzke, 2021). In this sequence, it is an 'encountering' of Catholic religion lesson students in German schools with regard to Muslim citizens living in Germany. The main idea behind the production of such an explanatory video is that by watching these video vignettes produced by teachers, students shall be sensibilized to Muslim citizens practices like the prayer call (muezzin's call), the building of new mosques, etc. These explanatory videos have the benefit of being an economic way of giving (first) 'encounters' since religion educational questions can be focused without the necessity to visit real mosques (repeatedly) due to the potential of digital media to conserve auditive and video data in a multimodal way and with less volatility of knowledge (see section 2.1), although it should be highlighted that these explanatory videos do not replace a real-world 'encountering' experiences.

In the transcription below, the planned video-script is depicted and will be analyzed to make assumptions about possible 'beliefs' since the students implemented imagined explanation and reflection processes in the video script and via these implementations, specific subjective notions, indexicalities and 'beliefs' can be reconstructed (see section 2.2) since a *"text – understood in a broader sense as every form of expression, not only written, but also oral sequences, and as a sequence of language production – does always comprise of aspects "apart from the intentions of those who produced it" (Rosenthal, 2018, p. 18) – like implicit, unnamed but relevant political views and ideologies or specific pre-suppositions about rules, procedures, meanings etc."* (Kuzu, 2023e, p. 19). A detailed process-analysis of the interview data was also conducted (Ratzke & Meyer, 2022) but the main analytic focus lies on an interpretative analysis of the video script. In the video-script, a voice from the Off comments on the scenery, which involves the imagined Christian student 'Christina', who has questions about the practices of Muslim citizens, and to answer her questions, 'Christina' asks her imagined Muslim friend 'Lina' for answers.

In turn 10, the voice from the Off makes a starting comment on the scenery from the explanatory video. It is not the entire script but only an excerpt from it, which refers to a passage in which something surprising happens: Christina hears a muezzin call. In turn 11, Christina then asks herself loudly, what the 'muezzin call' stands for and what it means, but at the same time, she also asks about the function of the call ("What is it used for?"). In turn 12, the voice from the Off comments that Christina then asks a Muslim friend of hers (Lina) for help. Since Lina is no Muslim

Table 3
Transcript sequence from the Catholic religion education study

Turn	Person	Transcript
10	Voice from the Off	As Christina walks past the newly built mosque in her town, she hears a loud chant. Some children run past shouting 'the muezzin's call'. Christina doesn't know what the children are talking about, so she wonders *[reads out the script text]*.
11	Chr	What is the muezzin call? What is it used for?
12	Voice from the Off	To get a suitable answer to her questions, she asked her school friend Lina
13	Lin	In Arabic, muezzin means nothing other than a call to prayer. The muezzin calls to prayer five times a day from the minaret, a tower in the mosque. At dawn, at midday, in the afternoon, in the evening and at night.
14	Chr	You just mentioned a minaret. What is that actually?
15	Lin	The minaret is also known as the lighthouse and is an integral part of the mosque. It is usually used to call the congregation to prayer via a loudspeaker.
16	Chr	So the call to prayer also preaches from this minaret?
17	Lin	No, the kursi is never used for normal sermons. For Friday and holiday sermons, the imam, an Islamic scholar, uses the minbar. This is located to the right of the mihrab, which is a niche in the wall of the prayer room that indicates the direction of prayer in the mosque, namely towards Mecca. These two features can be found in every prayer room. The prayer room is divided into two parts, sometimes with two separate entrances. The women pray in one, the men in the other, so that neither can distract the other during prayer. The floor in the prayer rooms is covered with carpets to protect us from the dirt on the ground so that our prayers remain valid. Hygiene is very important when praying in Islam. In order to pray, we must be clean. Therefore, we must perform ablution before prayer. That is why we also have washrooms in front of the prayer rooms.
18	Chr	And your pictures and statues? Where can you find them in the mosque?
19	Lin	The pictorial representation of our prophet Mohammed or of God himself is strictly forbidden in Islam. That is why we do not have any statues or pictures to worship in the mosque. However, verses from the Koran or names of important people such as our Prophet's companion or God himself can sometimes be found on the walls.
20	Chr	Could you only pray in a mosque?
21	Lin	No. There are also rooms in a mosque where, for example, Koran lessons take place and lectures are given. Religious festivals are also celebrated in a mosque. It therefore serves as a community center for all the needs of the community.
22	Chr	You recently showed me a picture of a large mosque from Morocco. But it looked completely different from the mosque in my city. Why is that?
23	Lin	In some countries, the mosques are larger and more ornate than in Germany. Although there are also many Muslims in Germany, most mosques were only built for a temporary period during the guest worker generation and are therefore often simpler and smaller. There is a lot of freedom in terms of design. However, the features I have mentioned must be present in every mosque.
24	Chr	Thank you for answering my questions. I have now learned a lot of new things about the mosque as a sacred space in Islam. I now know that the muezzin is a prayer caller who calls the congregation to prayer from the minaret, a tower in the mosque. In addition, prayers in the mosque are always in the direction of Mecca. The ablution before prayer is of great importance. There are no statues or pictures in the mosque, but the mosque is not only used for prayers, it is also a community center for all matters concerning the community."

name⁴, the choice of names gives first insights on specific possible 'beliefs' of the prospective teachers: They either seem not to know typical Muslim names (which could be looked up easily) or seem not to care about it, probably because it is a Catholic religion education class with no Muslims. Instead, they choose 'Lina', which is a typical, often-used German name. In either case, it can be assumed that most likely, a belief like ||*Authentic names of Muslim characters in explanatory videos are not important*|| might have played an important role regarding research question Q1. Regarding the notion of 'encountering', which is based on *authentic* impulses, only a partially-viable understanding can be reconstructed: The prospective teachers seem to have understood that 'encountering' means to ask or let the people from other religions or non-religious groups speak, but they seem to implement it in the video in a non-authentic way, at least regarding the names of the imagined students in the video. In <u>turn 13</u>, 'Lina' then answers as intended and by giving an extensive 'expert answer', thus another hypothesis with regard to the narrative of the video – a Christian character has a question, a Muslim character has to answer – emerges: It could be a slightly paternalistic imagination of the relation between both religious groups insofar as that the 'others' – here the Muslim group – should or will be giving answers, framing (see section 4.1) the discourse like an interrogation, which might lead to another possible belief regarding research question Q1: ||*Questions from majority group subjects (here: the Christian figure 'Christina') should be answered by minority group subjects directly (here: the Muslim figure 'Lina')*||. However, this hypothesis cannot be confirmed (yet), the imagined interaction between 'Christina' and 'Lina' just starts at turn 12 and 13 and the analysis of the following turns will show, if 'Lina' will also have opportunities for asking questions herself or if the indicated interrogative pattern will continue.

In <u>turn 14</u>, the script goes on with another question 'Christina' has with regard to the answer 'Lina' gave in turn 13: She asks what 'Lina' meant by "minaret" and 'Lina' then explains in <u>turn 15</u> that it is also called "lighthouse" and that its function is to call the Muslims for prayers. Here, a mistake becomes obvious: A minaret is no "lighthouse", that would be an old and rather direct translation of the Arabic word, but no Muslim would describe the "minaret" as a lighthouse, it rather is a tower for the prayer call, which 'Lina' also mentions in her explanation in turn 14. <u>Turn 16</u> then goes on with another question 'Christina' has and this time, the prospective teachers seem to implement a mistake purposefully: 'Christina' asks if the "minaret" is also used for preaching processes ("also preaches from this minaret?", see turn 16). Again, as was already assumable in turn 11 and 14, 'Christina' tends to ask short and focused questions, which 'Lina' has to answer directly, thus, the imagined dialogue follows the presumed interrogative pattern, and the short question asking of 'Christina' reinforces this impression. Normally, being sensitive about religious knowledge and feelings, one would never ask such direct questions, but this does not mean that the prospective teachers are generally insensitive, it just shows that the script is not conceptualized in a sensitive way. <u>Turn 17</u> then goes on with an extensive answer of 'Lina', where she uses plenty of Arabic terms like "kursi", "imam", "minbar", etc. but these terms are only partially explained: "kursi" for example is not explained, whereas "minbar" and "mihrab" are described regarding their place in a mosque ("the minbar. This is located to the right of the mihrab, which is a niche in the wall of the prayer room that indicates the direction of prayer in the mosque, namely towards Mecca", see turn 17). She then goes on with explaining the structure of the prayer room ("The prayer room is divided into two parts, sometimes with two separate entrances. The women pray in one, the men in the other, so that neither can distract the other during prayer", see turn 17) and then explains a prerequisite for praying, which is being 'ritually clean' ("In order to pray, we must be clean. Therefore, we must perform ablution before prayer. That is why we also have washrooms in front of the prayer rooms", see turn 17). Here, different types of explanations become visible:

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⁴ Muslims normally do not use the name 'Lina', at least not in the form it was used and articulated by the prospective teachers. It rather is a very common name in Germany, either in the short form 'Lina' or in the long form '(C)Selina'.

'Lina'

- explains-WHY, e.g., why Muslims have to pray in a specific direction (the reason being mentioned is that Muslims want to direct their prayers to Mecca) and
- explains-WHAT, e.g., what is part of a mosque ("minbar", "mihrab", etc.), how it is placed within the building/ the mosque, etc.

In <u>turn 18</u>, 'Christina' then goes on without thanking 'Lina' for her extensive answer and directly asks another question, which is interesting regarding its 'logic': Being typical for churches and Christian prayer rooms, 'Christina' asks if there are pictures and statues in mosques (see turn 18). The prospective teachers might have implemented this question on purpose since it is one of the biggest differences as well as international 'conflict points' between Christians and Muslims: Muslims do not use pictures and statues, instead they use Calligraphy as a religious art form. Historically, that has to do with the conflicts Muslims had with the Polytheist 'statue builders' in Mecca as well as religious norms (pictures and statues are forbidden in the primary texts of the Muslims, and furthermore, prophets and humans shall not be deified), which is why they are sensitive about this aspect. That the prospective teachers decide to let 'Christina' ask such a conflict-laden question is interesting since it shows a confrontative approach to asking questions or speaking about differences, which does not automatically contradict the idea of 'encountering': Differences are part of the ambiguities that have to be tolerated and speaking about them directly is one possibility to foster ambiguity-tolerance (Bauer, 2011; Ratzke, 2021). The question is, how these differences are 'framed' and beside of the slightly interrogative pattern in the imagined interaction sequence, there is no directly negative frame visible in the question itself. The answer 'Lina' gives in <u>turn 19</u> is highly sensitive from a religious viewpoint since it explains-WHAT (that pictures and statues are strictly forbidden for Muslims), although an explanation-WHY is not given (e.g., that it is written in the Quran, that there were conflicts with Polytheists, etc.). Yet, 'Lina' also highlights that there is the religious art form of Calligraphy in mosques ("verses from the Quran or names of important people such as our Prophet's companion or God himself can sometimes be found on the walls", see turn 19). This indicates that the prospective teachers have done research on this subject and now let 'Lina' mention it, being an important 'encountering' facet due to the fact that it is mentioned as an alternative as well as equivalent form of art.

<u>Turn 20</u> then goes on with another question of 'Christina', this time with regard to the functionality of the mosque: She asks if Muslims "only pray in a mosque" (see turn 20) and in <u>turn 21</u>, again, 'Lina' answers by giving an extensive answer about further functions of a mosque ("Quran lessons take place and lectures are given. Religious festivals are also celebrated in a mosque. It therefore serves as a community center for all the needs of the community", see turn 21). Agani, it is a rather positively framed answer since 'Lina' mentions positive notions like "community center", "celebrations", etc. <u>Turn 22</u> follows the interrogative pattern and another question is asked by 'Christina' regarding different types of mosques (she mentions a picture of a mosque from Morocco she saw which was different from the German mosques). Lina's answer to this question in <u>turn 23</u> is complex: She mentions historical roots – 'Guest workers' (referring to the working-migration to Germany after the 1960s, mostly from Turkey, Greece, Italy, and Spain) – and explains-WHY these mosques were smaller and simpler than the Moroccan mosque (by stating that they "were only built for a temporary period") but that is an explanation from the majority-perspective: For German politicians like Kohl, Guest workers only should have stayed for a short time (before going back to their home countries) but most of the Guest workers came to stay and successively brought their families along. They lived in segregated and socio-economically problematic areas and the mosques in these regions were built in a small and simple way due to a) financial reasons (most communities were and are still poor) and b) due to no other options than to build mosques in so-called 'Hinterhöfen', meaning the building of mosques in industry regions, behind train stations, etc. since Germans often did not want to have mosques near to town centers or in urban areas (Alkın et al., 2021). Thus, 'Lina's answer fades out the problematic, discrimination-related facets and only 'voices' the perspective of the majority. Since

the prospective teachers planning the video script are part of the majority, the bias is not surprising, but it shows a specific obstacle in the planning and development of scripts for explanatory videos with regard to research question Q2: When teachers plan a video from the standpoint of an expert without being real experts, without having subjective experiences or without asking experts, they might miss important facets. As Harding (1991) states in the context of the constructivist standpoint theory, "*the reality of how […] social order is in fact constructed and maintained […] is not something that anyone can have simply by claiming it. It is an achievement. A standpoint differs in this respect from a perspective, which anyone can have simply by 'opening one's eyes'*" (Harding 1991, p. 127). Thus, minorities and their subjective experiences cannot simply be 'emulated' by subjects from majority groups, which is an important limitation in the production of explanatory videos: Giving imagined explanations-WHY from the perspective of specific subjects – like subjects from minority groups – means that (real) subjects from those groups have to be included, a talking about 'them' without 'them' tends to be miss important subjective facets and experiences, in the worst case it can be biased, presumptuous or tendentious, the latter also becoming visible in the explanation-WHY of 'Lina' in turn 23. In the last turn of the transcript of the video-script, in turn 24, 'Christina' summarizes what she has learned, but she focuses only the 'hard facts' (names of the places and the general functions of it) and does not mention, e.g., the aspects Lina mentioned in turn 23 regarding the size of mosques in Germany and recent history of mosque-building in the context of the Guest-Workers. From this imagined summary, one can conclude that these aspects seemed to be the most important to the prospective teachers who planned the script. After turn 24, the final turn of the sequence, the hypothesis from turn 12 and 13 can be regarded as being confirmed: the narrative of the script is interrogative, 'Christina' asks the imagined Muslim peer 'Lina' direct and intimate questions about the religious practices and 'Lina' has to answer precisely. Thus, the imagined interaction is, as assumed, slightly paternalistic and thus contradicts the notion of 'encountering', the prospective teachers only show a partially-viable understanding of this notion: They consider an interaction to be a way to 'encounter', which is viable, but the conceptualization of the interaction is non-authentic because a) the imagined name of the Muslim character is not a Muslim name and instead, a typical Christian name is chosen, b) the interaction follows an interrogative pattern and c) standpoint theoretical aspects are (with regard to important and subjective minority-experiences) not included. Here, a specific obstacle in producing teacher-explanatory videos for students becomes visible with regard to research question Q2: It is planned by non-Muslims imagining Muslim side characters instead of planning the video as a collaboration with Muslims – a planning process which, if, e.g., students produced explanatory videos, could be realized easily in German school contexts since statistically, 10% of all students in Germany are Muslims (MDI, 2023). Yet, it is not fully paternalistic since the answers given by 'Lina' also show a sensitive way of mentioning Muslim practices, like the usage of Calligraphy as art form instead of pictures and statues (see turn 18).

A detailed analysis of the language means being used in the whole video-script reveals that the prospective teachers endeavor to use neutral and explanatory language in the explanatory video by using appropriate language means for the elements of the mosque (like "minbar" and "kursi", see turn 17). However, there is a slight shortcoming in the presentation of the mosque in the use of Arabic content-related terms, which are not directly explained by the learners, as is to be expected in the explanatory video format, so that Christian students can understand them immediately (see turn 17). Still, turn 12 and turn 17 indicate that a subject- and language-integrated mode of expression is important to the prospective teachers when creating explanatory videos since the imagined script does not only focus on the use of the correct Arabic language means but also on the use of *diversity-sensitive* language, e.g., language that takes (presumed) emotions and religious feelings into account, which is a genuine religion education perspective on the use of language (see section 2.1): In turn 12, the voice from the Off announces that 'suitable answers' are necessary and in turn 17, the imagined Muslim 'Lina' gives a detailed answer being sensitive to aspects like being clean and hygienic when praying, the separation of women and men in the process of praying and

even entering the mosque. With regard to the interreligious skills of changing perspectives and for fostering an empathic way of thinking and working of prospective Catholic religion education teachers, thus the explanatory video analyzed here has the potential to develop (first) interreligious skills that prepare teachers for a more in-depth understanding of other religions or world views (Boehme, 2023; Mesanovic, 2023) but this potential should not be overgeneralized since at the same time, specific facets like the problematic name-choices, the interrogative narrative pattern and slightly tendentious answers (see analysis of turn 23) also became visible.

Before producing explanatory videos, an interreligious team teaching and/ or the excursion to a mosque can turn out to be effective because then, the religious content in the explanatory video can be organized with first-hand information – with information from subjects, subjective experiences and 'standpoints' – and the content can be more substantiated. In the analysis, the video script showed that the prospective Catholic religion education teachers could change their perspective partially, as they could reflect on and articulate the statements about the mosque through the imagined Muslim 'Lina' (see turn 13, 15, 17, 19, 21) and e.g., by being sensitive about the different ways in which the image of God is portrayed in Christianity and Islam (see turn 19), but the 'encounters' they planned and implemented in the video script were not fully authentic and viable regarding the critical points mentioned above. Still, explanatory videos can represent a central didactic form of learning about religion thanks to heterogeneity-sensitive tasks, a self-directed way of developing and producing the videos and the potential for visualization and long-term memorization via multiple takes (see section 2.1). Non-perfect or problematic video takes can be optimized, e.g., with regard to tendentious aspects, false names, etc., these can easiliy be corrected if an iterative approach is chosen (see section 2.1). The positive as well as negative assumptions regarding the script planning process are no argument to reject the usage of explanatory videos in general, they rather show what is often emphasized in research about explanatory videos: Students or teachers making explanatory videos should work with storyboards (see section 3.2), should make multiple takes and should reflect on the quality and subject-specific viability of their ideas in 'video conferences' (see section 2.1.). One could also argue from a pedagogical perspective that non- or only partially-viable beliefs, as they were reconstructed above, could be made visible through the video script so that an important possibility for assessment is given. Thus, the production and reflection of explanatory videos can contribute to more viable learning processes in the context of interreligious education (Arnold & Zech, 2019), if their quality is reflected: In the production and reflection of explanatory videos, students or teachers can expand their orientation knowledge about other religions or world views, review their attitudes and options for action and rethink stereotypes and prejudices (Unser, 2022). However, Ratzke and Meyer (2022) point out that the iterative production of explanatory videos in Catholic religion education, including reflection processes, is still in its infancy, although the potential of digital media is widely acknowledged across subject didactics (Sterzing, 2022; Wolf & Kulgemeyer, 2021).

Not being visible in this sequence but being part of the study, the prospective teachers reflected about their learning processes after producing the explanatory videos and those reflections can be differentiated into retrospective and prospective reflections: From a retrospective perspective, the prospective teachers were able to present the explanatory video they had produced in the context of the seminar for critically examining the tendentious aspects etc. They reflected upon the production process of the explanatory video in conferences. Being guided by the seminar leader and fellow prospective teachers, they reflected upon missing aspects, the paternalistic video structure, etc. and came up with ideas for video takes with a higher quality, which included prospective reflection processes (regarding future video script plannings). For this reason, receiving peer feedback from fellow students, teachers, etc. is highly important (Gmoser et al., 2023). Furthermore, from a prospective perspective, teaching and learning needs in teacher training were also identified by the prospective teachers and these insights contributed to the professional development of teachers in teaching and research (Heil, 2018; Ratzke & Meyer, 2022,

2024). For example, the poor quality of the used image material from the internet was an aspect the prospective teachers mentioned as an obstacle they should (re-)consider in future takes.

In conclusion, the analysis in this section has shown that prospective teachers' choices with regard to interaction structures/ patterns, names, language means and images should be reflected, especially if scripts are produced about 'others' (like Muslim minorities) without a participation of the subjects of these explanatory videos (e.g., by producing the videos in teams of Christian and Muslim teachers, students, etc.). This is important so that the learning processes initiated do not remain unreflected since misinterpretations can emerge – as was visible in the analysis in this section – and should be corrected for gaining new and deeper perspectives. Thus, regarding research question Q2, the production of unreflected explanation video scripts in the context of interreligion topics can be an obstacle for (viable) learning processes but at the same time, it might become an important potential if they are reflected and lead to new, optimized video scripts and takes.

5. Discussion and Limitation of the Results

In this article, explorative insights are provided into reflection and production processes regarding explanatory videos produced by either learners (see section 4.1) or prospective teachers (see section 4.2) (see Figure 1). Concerning the research questions, the analyses in section 4 provided empirical insights into such reflection and video production processes of primary school pedagogical and Catholic religion education learners and prospective teachers. Both analyses highlighted various potentials and obstacles and offered important insights into the production and evaluation processes of teachers, which will be briefly discussed in this section.

The primary school pedagogical analysis showed an important diagnostic potential of using explanatory videos: Teachers can utilize videos produced by learners for reflecting on their learning processes, as well as their competencies, capabilities, and performances. It was possible to reconstruct a decelerated teacher assessment and reflection process: The teacher recognized that learners used their own language means and languaging processes when producing explanatory videos and that they understood the content better than he expected by doing so (see section 4.1). This aligns with Swain's pushed-output hypothesis (1985), which could als be substantiated in further analyses (Kuzu, 2023b, 2024), and was also realized (partially) by the teacher after watching the explanatory and video production process videos of his learners. After an initial, at first deficitary assessment, the teacher revised his evaluation of the learners' competencies, capabilities, and performances. Thus, possible (initial) effects of such decelerated re-evaluation processes on reconstructed beliefs could be assumed: Particularly, the comparison of the first memo with subsequent memos revealed 'moments of surprise' in the teacher's reflections at the level of values and beliefs. Initially, the teacher did not anticipate that his students could a) produce a high-quality explanatory video and b) effectively utilize their own multilingualism. However, upon watching the videos, he was surprised by the viability of the explanations and the functional use of his students' multilingual resources, contrary to his prior assumptions (see section 4.1). Thus, through watching and reflecting the explanatory videos and the video production process videos, a decelerated and more precise evaluation process of his students' competencies, capabilities, and performances was facilitated. At the same time, from the students' persective, the multilingual production of explanatory videos allowed them to use all of their linguistic resources, highlighting an important subject-and-language-related potential for the use of explanatory videos in linguistically diverse learner groups (Kuzu, 2023b, 2023c). An obstacle and challenge arises if a teacher does not speak the languages of his or her learners, potentially leading to misunderstandings about what the students are saying. However, the latest AI systems and translation technologies, such as LLMs like ChatGPT, can help: These systems are not only multilingual but can also translate ad hoc between different languages, language registers, and language varieties, whether in written or oral form (Kuzu, 2024b; Ray, 2023).

The Catholic religion educational analysis indicated that the production of explanatory videos from teachers for learners allows prospective teachers to reflect on their non- or not-yet viable a) approach to religious diversity and b) assumptions with regard to specific religious groups and their practices – here, with regard to Muslim practices – by analyzing the diversity-sensitive language usage in the video planning process (see section 4.2). An example was given for a not-perfect video script of explanatory videos developed by prospective teachers which included tendentious aspects like non-muslim names for Muslims as well as a slightly paternalistic narrative (a Christian asks, a Muslim has to answer), which had to be reflected in interreligious learning environments after the video take. Although the analysis might seem deficitary at first, the opposite is the case: An important diagnostic potential emerges if non- or not-yet viable interpretations are viewed as an opportunity for further reflection. Without the explanatory video planning process, these problematic facets would not have been observable, and thus, the reflection process in the seminar would not have been possible. However, such a productive approach to mistakes and non-viable or not-yet viable interpretations requires a constructive perspective on mistakes – viewing them as opportunities for reflection rather than reasons for sanctioning, for example, through harsh criticism or poor grades. Similar to the revised assessment processes in the primary school pedagogical study, the prospective teachers in the Catholic religion educational study could optimize and revise their non- or not-yet viable approach and assumptions. Thus, in the context of the Catholic religion education study, it can be emphasized in particular that the production of explanatory videos is a good opportunity for making visible implicit assumptions and triggering retrospective and prospective reflection processes with regard to the viability of these assumptions. The prospective teachers in the selected study group were empowered to use digital media by making and planning explanatory videos but at the same time, they had the opportunity to reflect upon their own approaches, assumptions and biases (after the video take).

To summarize the insights into the potential of making explanatory videos regarding research question Q2, across both subject areas, it was shown that an important potential, from a producer's perspective (be it a learner or teacher), lies a) in the possibility for an iterative elaboration and consolidation of knowledge (if multiple videos are planned) and b) in the possiblility for revision and correction of non-viable interpretations, assumptions, etc. (if videos scripts and takes are reflected actively in 'conferences'). From a teacher's perspective, an important potential lies in the possibility and necessity to thoroughly examine the content as well as linguistic aspects and the content-and-language-sensitive planning of explanatory videos (see section 4.1 and 4.2). In both studies, a diagnostic potential with regard to a) students performances and b) teachers assumptions emerged, which is a new and not yet often described potential of explanatory videos going beyond solely digital-media related or subject-didactical goals: The production and reflection of explanatory videos encompasses educational core activities such as diagnosis and reflection on competence attribution.

Limitations arise on the one hand with regard to the sample size, which is relatively small in both studies (n = 18 learners and n = 6 teachers in the primary school pedagogical study; n = 17 prospective teachers in the Catholic religion education study) but since it is an exploratory study, a small sample size is not unusual. Nevertheless, the findings from the teacher reflections and video planning processes are novel and important insofar as that they give interdisciplinary insights into specific beliefs and potentials as well as obstacles of using explanatory videos in pedagogical contexts, for example into the necessity to plan content-and-language-sensitive videos (see section 4.1) and to reflect on the viability of narratives, chosen names and (missing) subjective perspectives (see section 4.2).

Author contributions: All authors have made significant contributions to the study and have reached a consensus on the results and conclusions.

Data availability: The data is not publicly available due to the protection of the participants (children, prospective teachers and teachers in state schools). Researchers interested in the datasets can contact the authors to gain access to the anonymized data.

Disclosure of potential conflicts of interest: The authors of this article, Taha Ertruğrul Kuzu and Christian Ratzke, affirm that there are no conflicts of interest with funding sources, project partners, or other third parties.

Ethical statement: All subjects who participated in the study have given their consent for participation, for data collection, and for the analysis of the collected data. The data was analyzed only in anonymized form, and personal information that could lead to the identification of the participants has been removed. No additional ethical approvement was needed.

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