Teachers Designing Their Lessons: The Complex Stage of Educational Resource Selection

Anita Messaoui(✉)

S2HEP, ENS Lyon/ACTé, Université Clermont Auvergne, Clermont Ferrand, France
anita.messaoui@ens-lyon.fr

Abstract. This chapter provides an analysis of the documentation work enacted by an English teacher designing a new lesson for sixth grade students in France. The overall goal of the study was to understand which knowledge is involved in the process of resource selection and how it participates in teacher professional development. The application of the documentational approach to didactics along with the conceptualization in action theory served as grounds to the study. Thereby, the documentation expertise refers to the teacher's interaction with resources, including their selection. Data collection consisted of recorded lesson preparation, interviews, recording of resources used and produced. The main results show five types of knowledge involved: knowledge of subject content, didactic knowledge, curriculum knowledge, knowledge of students, and knowledge of the informational environment. While it offers valuable insights, the research on educational resource selection remains a case study and requires further and broader work.

Keywords: Documentation expertise · Information literacy · Lesson designing · Teacher professional development · L2 English teaching

1 Introduction

In France, a major curriculum reform for middle school was implemented in September 2016. The two main changes were a new curriculum structure based on a three-year cycle instead of a one-year cycle and the introduction of new content to be taught, such as algorithms in mathematics (Gueudet et al. 2017). Some of the expected outcomes are more collective work to implement the curriculum and the design of new educational resources. In addition, over the last decades, French teachers established a new trend by using computers as a personal tool for preparing their lessons and by looking for resources on the Internet more frequently (MEN 2017). They use institutional or personal websites, but also digital textbooks (Messaoui 2016). Moreover, a lot of teachers, such as foreign language teachers, use YouTube on a daily basis. The French national research program ReVEA (*Ressources vivantes pour l'enseignement et l'apprentissage*, Living Resources for Teaching and Learning, 2014–18) analyzed this process of change and its possible impact. Thereby, the program followed three main objectives: description of the changes in resources mobilized by teachers; modeling the

P. Bagoly-Simó and Z. Sikorová (Eds.): IARTEM 2015, *Textbooks and Educational Media: Perspectives from Subject Education*, pp. 279–293, 2021.
https://doi.org/10.1007/978-3-030-80346-9_23

life cycle of a learning resource; and, observation of how teachers' work changes. The program focused on the subjects English, mathematics, physics, chemistry, and industrial and technology science at secondary level (students aged 11–18 years). The participants were in-service teachers.

Within the reformed context and under the circumstances of increasing digital practices, interaction with resources requires teachers to develop various skills. The overall goal of the author's research is to examine how teachers develop their information literacy skills when they interact with resources to define what might be considered expertise in this field.

This chapter focuses solely on the process of resource selection during lesson planning. In order to define the required skills and their development, the chapter explores two research questions. On the one hand, it aims to explore which knowledge guides teachers' activities during the selection of resources. On the other hand, it aims to understand how the selection process interacts with lesson designing. Three main fields of theoretical framework serve to address these two research questions, namely activity analysis (Vergnaud 2009), didactics (Gueudet et al. 2012), and information seeking (Rouet and Tricot 1996). Following the theoretical framework, the chapter offers a brief overview of the research methods, introduces the findings and their discussion, and closes with some conclusions.

2 Theoretical Framework

Three aspects constitute the theoretical framework underlying this chapter. First, we present the concept of *scheme* as a conceptual tool to analyze teachers' activities and highlight knowledge involved in these activities. Subsequently, we proceed to viewing our questions within the framework of the documentation approach to didactics and pedagogical design capacity. Finally, we reposition the process of resource selection within the set of skills of information literacy.

2.1 Conceptualization in Action

Documentation is an important part of every teacher's work. Therefore, further analysis of the information literacy skill development, with special emphasis on the professional knowledge involved, is necessary.

Most models of teachers' professional knowledge (Shulman 1987; Park and Oliver 2008) are static and do not consider knowledge in a developmental way. Pastré et al. (2006) proposed a model that provides a framework to analyze teachers' professional knowledge development. Vergnaud (2009) distinguished two sorts of knowledge: operational (the ability to do something) and predicative knowledge (the ability to explain what one does). Operational knowledge, also called knowledge-in-action, is richer and more complex than predicative knowledge. The author argues that operational knowledge is both built in action and leads action. The concept of *scheme* is at the core of this approach and enables the understanding of how knowledge is developed. *Scheme* as a concept originates from Piaget's work. However, Vergnaud (2009, p. 88) refines the definition of *scheme* by pairing it with a given class of situations:

"[…] a scheme is the invariant organization of activity for a certain class of situations". *Scheme* drives the activity to achieve a type of task.

Vergnaud (2009) identified four components of a *scheme*. The intentional aspect is the first component of a scheme and it posits it following a main goal and intentions. The second component–the generative aspect–involves rules of action, control, and information, which are the most observable part of a scheme. Action is guided by the operational invariants, which constitute the third component. The two types of operational invariants are concepts-in-action (assertions considered as relevant for a class of situations) and theorems-in-action (assertions considered as true for a class of situations). Lastly, the possibilities of inferences are the ability to adapt the action to the right situation; this represents the computational aspect–the fourth component of a *scheme*. The combination of these four elements provides an analytical framework to explore the documentation work and understand the development of teachers' professional knowledge.

2.2 Documentational Approach to Didactics and Pedagogical Design Capacity

The *scheme* concept is also part of the documentational approach to didactics (Gueudet and Trouche 2012), introduced to study the interactions between teacher and resources in a didactical perspective. It combines the instrumental approach (Rabardel 2002) and a new way of defining the concept of document in the digital century (Pedauque 2006). Interactions between teachers and resources carry the name documentation work, which is composed of actions, such as searching for and finding resources, adding resources to one's resource systems, adapting and altering resources, and, of course, selecting a resource (Gueudet and Trouche 2012). According to Rabardel (2002), the transformation of an artifact into an instrument implies appropriation processes. Gueudet and Trouche (2012) adapted this model to the appropriation of resources by teachers. All the resources produced, collected, and recombined by teachers make up their resource system.

Teacher's interaction with resources combines two processes, namely the instrumentation (influence of resources on teachers' activity) and the instrumentalization. The latter refers to the creative adaptation of resources by a teacher. Instrumentation and instrumentalization lies at the core of the documentational genesis:

> The teacher, in her documentation work, for a given class of situations, draws on a set of resources of various natures. Introducing a new vocabulary, we consider that this set of resources bears, for this class of situations, a document, within a documentational genesis. The documentational genesis jointly develops a new resource (made up of a set of resources selected, modified and recombined) and a scheme of utilization of this resource (Gueudet and Trouche 2012, p. 27).

Recent developments of the documentational approach to didactics focus on knowledge implied in the teaching design process (Pepin et al. 2017). Pedagogical design capacity (PDC), a concept coined by Brown (2009), refers to the teacher's ability to employ personal resources as well as resources embedded in the materials themselves to make productive changes to curriculum materials. For Pepin et al.

(2017), these changes might be produced by the documentational genesis. They refine Brown's (2009) point of view and propose both a new definition and components for PDC: "Teacher design capacity can be described as the creation of *something new* (e.g., combining existing and novel elements) as a deliberate/conscious act in order to reach a certain (didactical) aim" (Pepin et al. 2017, p. 801). There are three components inherent to teacher design capacity: (1) orientation, goal or point(s) of reference for the design; (2) a set of design principles which might be firm or flexible; and, (3) a reflection in action. Our hypothesis is that the expertise in the process of selecting a resource is a part of teacher design capacity, as teachers must first have selected the resources before combining novel elements. The next section described the process of resource selection in light of the models of information seeking.

2.3 Information Literacy and Information Seeking

The third and final part of the theoretical framework concerns information seeking. The standards and framework for information literacy in higher education published by the Association for College and Research Libraries (ACRL 2000, 2015) defines information literacy as "[…] a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." (ACRL 2000, p. 2). While this definition offers landmarks, it is insufficient to really understand the process of selecting a resource. In a literature review, Dinet et al. (2012) compared different models of information retrieval. While most models failed to articulate an information retrieval process, the Evaluation Selection Processing (ESP) model by Rouet and Tricot (1996) viewed information retrieval as a planned, metacognitive, controlled, and regulated activity. The ESP model rests on a simplified version of Guthrie's (1988) cycle vision and prescribes three steps. The first step is the evaluation of the required information during which the representation of individual goals occurs. The second step consists of information selection, while the third and last step covers the processing of information (i.e., the content is assimilated). Following the third step, a new cycle begins with the comparison of the information processed with the representation of the goal. Three possible scenarios emerge: (1) the selected information matches the aims and the process stops; (2) the selected information matches the goal only partially, and leads to an alteration of the original goal prior to the continuation of the research; or (3) the information selected does not match the goal and the research strategy has to be changed. According to the ESP model, the selection process is strongly tied to the identification of required information, the representation of the goals, and to the evaluation of processed information (what is understood from the selected information). Following this method, the *relevance* criterion seems to be crucial when deciding on selecting a particular resource.

Based on an exhaustive literature review, Mizzaro (1997) defined relevance as the compatibility of the information a resource carries with the user. This depends on the three categories content, use, and context. Diekema and Olsen (2012) also underline the importance of relevance in teachers' information management practices. But what can help teachers to decide what is relevant? Knowledge about the content, the use and the context might help the teacher to define the relevance of a resource.

In sum, the theoretical framework of this chapter contains the combination of three different approaches to analyze knowledge mobilized during the stage of resource selection. Using the *scheme* concept is crucial to characterize knowledge involved in the stage of resource selection. Selecting the relevant information is part of information literacy and, according to the ESP model, the stage of resource selection depends on the individual's capacity to evaluate the required information and process the selected information. Our hypothesis is that the knowledge guiding teachers' actions during resource selection assists them in determining each resource's relevance. In consequence, the operationalization rests on the observation of a lesson preparation situation. This enables the examination of what part the stage of resource selection plays in the pedagogical design capacity. The next section contains detailed information on the methods.

3 Methods

Resource selection is a common task teachers carry out during lesson designing. Exploring the way teachers select resources implies a dual perspective that considers both what stakeholders related about actions and what these action are made of. Qualitative methods served to answer the research questions.

3.1 Reflective Investigation

The methods applied in this study rest on Gueudet and Trouche's (2012) four principles of reflective investigation. The *first* principle is a reflective follow-up of the documentation work. The teacher is involved in the data collection, and the follow-up tools put the teacher in a reflective stance. The main part of the documentation work is routine and teachers are not really aware of what happens. Therefore, tools developed in the reflective investigation (e.g., instructions to a twin) guide teachers to be aware of how they interact with resources. The *second* principle is a long-term follow-up that is necessary to distinguish the stable and contextual elements. This principle is essential for the identification of the operational invariants. Measuring the development of knowledge requires time, that is why the data collection happened over the course of two years. The *third* principle is an in- and out-of-class follow-up. As documentation work may take place anywhere, teachers are observed or accompanied at school, at home, and even in the cyber space whenever they are online. The *fourth* principle aims to record a broad collection of the material resources, including videos of the teacher's activity, interviews, as well as resources produced and used by the teacher.

It is crucial to stress that the methods chosen enable the goal to collect data about teachers' everyday activities. Enacting the four above-described principles implies in-depth follow-ups with a small number of teachers. The main objective is to achieve case studies with a focus on various details of teacher activity.

3.2 Data Collection

Following an exploratory study (Messaoui 2016) in a French middle school based on a questionnaire and a small number of interviews, three teachers–two teaching English as a second language, one mathematics teacher–were selected for in-depth follow-up.

The sampling was based on the subjects studied in the ReVEA project. Teachers' expertise concerning the interactions with resources might vary depending on the subject taught. Another criterion was the educational level the teachers worked in. From the perspective of teachers as subjects, periods of change are most favorable to observe the development of professional knowledge. Therefore, it was necessary that teachers had, during the empirical data collection, new lessons to plan in order to observe how selecting a resource was involved in pedagogical design capacity. Finally, the last two criteria were age and teaching experience. Throughout the study, the taught subject was the observed variable, so we chose teachers of similar age and with similar experience. The same data collection protocol was proposed in each case. The researcher signed a methodological agreement (Sabra 2016) with every teacher to guarantee their involvement.

During the first year, an interview along with a guided resources tour was conducted at the teacher's home. This was a semi-directed interview with instructions to a twin, during which the teacher presented her resources, explained how her resource system was organized, and described her habits connected to resources during lesson designing. In the aftermath of the interview, an initial profile was drawn up.

As a next step, the teacher recorded herself–alone and at home–designing a lesson for a new topic. She was required to record all her actions on the computer (Fig. 1), and, at the same time, to explain her actions. The software Camtasia served to record the screen-capture video. Along with the video, the teacher handed over to the researcher all digital and printed resources produced for the lesson. One year later, the teacher recorded the revision of the preparation of the same lesson. Then the implementation of the lesson in class was filmed by the researcher to observe how the teacher used the resources produced with students.

The self screen-capture video provided a lot of data collected in the teacher's natural environment. It was not an exercise in lesson preparation imposed by the researcher, but a real lesson she had to prepare for her students. Even if it was artificial to describe her actions while planning the lesson, such data collection is close to the teacher's daily activities, and the method can be qualified as *ecologic*. Furthermore, the video enables the analysis of her actions and to notice and take note whenever the teacher does something she does not explain.

Despite the advantages, the method also bears some challenges. First, the quality of the data is variable. While some teachers described in detail what they were thinking, others offered few explanations. Whenever teachers offered scarce information, inferences were made from the observation of actions. Second, the self screen-capture video is perfectly adapted to work on digital resources, but it is difficult to capture work done with paper resources, especially if the teacher is not talkative.

The follow-up is merely concluded with Audrey, one of the participating teachers. In consequence, this chapter focuses solely on Audrey's case study.

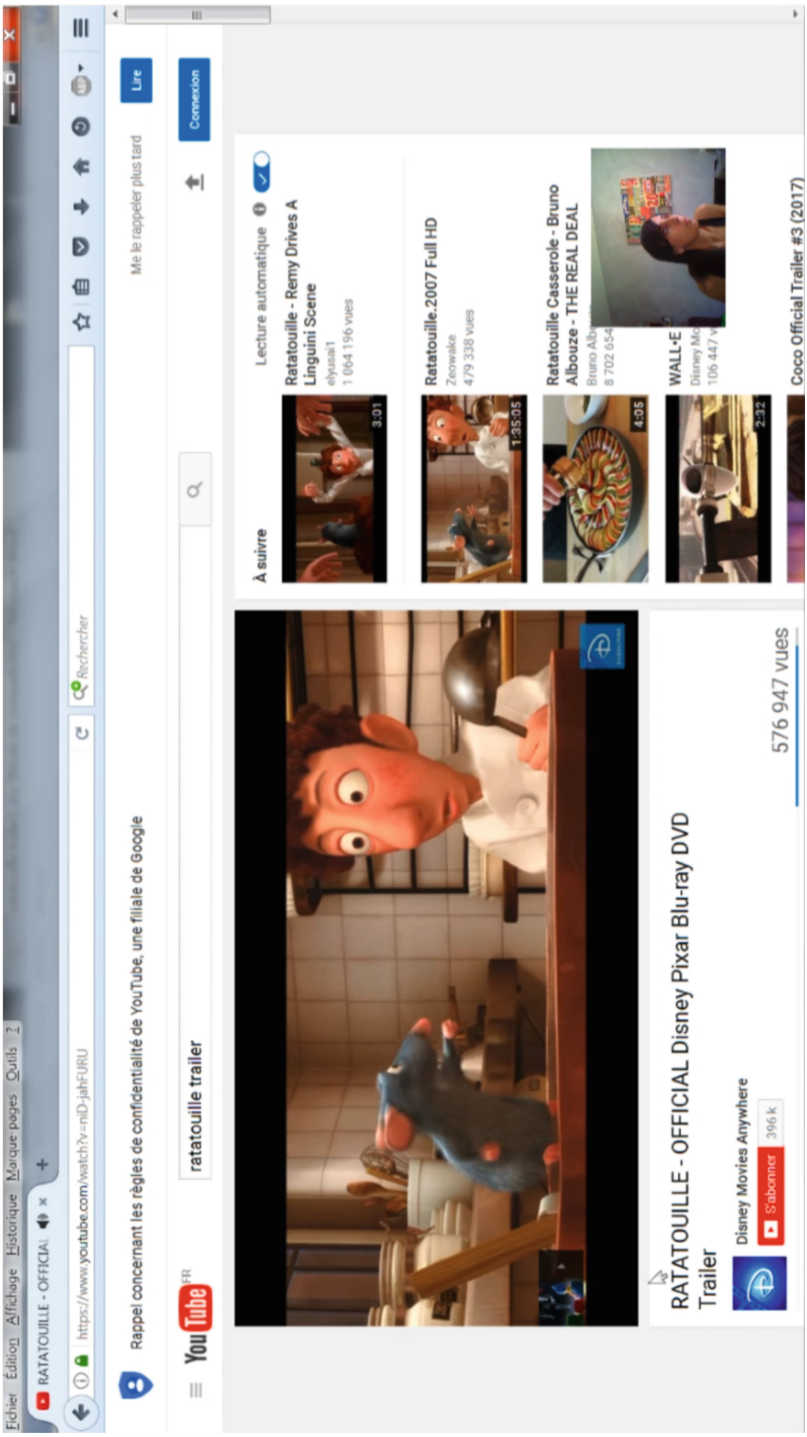

Fig. 1. Self screen-capture video (source: author).

3.3 Analysis

Data collected along the principles of reflective investigation is heterogeneous, as audio files, videos, transcriptions, digital files, websites, paper-based work, and extracts of textbooks constitute the corpus. Therefore, dealing with the corpus requires the ability to store and analyze diverse types and large amounts of data.

Initially, the software *Sonal* was chosen to transcribe, code, and store the audio tracks of interviews. However, challenges arose from the variety of data formats, reason why data analysis carried on with the qualitative analysis software *Atlas.ti.* This software enabled the direct coding of the individual videos without previous transcription. In a first step, the video files were cut into sections. In a subsequent step, keywords helped to describe each section. Lastly, the coding process took place. Scanned papers or digital files were also added and coded.

Coding was based on information literacy skills, the type of resources mobilized by teachers, and the components of the scheme. Codes were grouped into three categories and were developed during the exploratory stage of the study only to be enriched following the analysis of the first data. The first group described the components of information literacy referring to resource selection. The second group contained the different kinds of resources mobilized (e.g., textbooks, websites, teacher's resources). The last category clustered the components of a scheme (e.g., Vergnaud 2009), excepting operational invariants. Each teacher has their own operational invariants. In the analysis, they were identified in relation to the content (narratives and actions) associated with information literacy skills.

Despite the powerful features of *Atlas.ti*, data continued to be scattered due to its nature. In consequence, the IFÉ team component of ReVEA led a project to create the digital platform AnA.doc (Alturkmani et al. 2019). AnA.doc is a way to compare video and other materials collected by the research team for the different case studies. Its goal was to store and share raw data collected for the ReVEA project, context of data collection and interpretations made by the researchers. AnA.doc is structured in three levels, namely situation, webdocument, and glossary. In line with Vergnaud's (2009) theory, data of the first level is clustered by situation. Each data collection situation is described (methodology, goals, theoretical framework, research questions, context), stored, and made available at the same place with all the data linked to it. The webdocument level is attached to one situation and provides analysis for a specific research question, the answer to which is supported by short extracts from data associated with the situation. Thus, AnA.doc is a support to store, organize, and analyze the data.

3.4 Audrey

Audrey is a 34-year-old English teacher. After graduating in English literature and civilization at university, she moved to England for three years where she taught French. Once returned to France, in 2007 she passed her CAPES (*Certificat d'Aptitude au Professorat de l'Enseignement du Second degré*, Certificate of Secondary Education Professional Qualification) for English, and, after an internship at a high school, she prepared for and obtained the *agrégation*, a competition for accessing higher positions in France's education system.

Audrey began her career as a substitute teacher at different schools and then she settled in a suburban secondary school specialized on students with special needs for five years. In fact, when Audrey was transferred to the C secondary school in September 2015, she already was an experienced teacher. Nevertheless, she taught sixth-graders for the first time, reason why the topic present continuous was chosen for follow-up. The curriculum prescribes this topic to be taught at the end of the school year. The first self screen-capture video (40 min.) was made at the end of May 2016, just before the reform. In September, the guided resources tour was organized and the second self-capture video screen was recorded in May 2017 (duration 55 min.).

Regarding the resources she uses, Audrey does not approve of her new school's textbook *(Round the Corner)*, but she works with it occasionally because students receive it and the associated audio material is easy to obtain and to use. She prefers another textbook collection *(Enjoy English)* for which audio material is unfortunately not available. Audrey also uses a lot of digital resources, such as YouTube videos, Audiolingua files for audio material, and ISL collective for other teaching resources. Moreover, she has a large collection of self-designed educational games.

4 Results

This section presents Audrey's scheme *selecting a resource* as well as the relations between the selection process and the pedagogical design capacity.

4.1 The Scheme 'Selecting a Resource'

When Audrey prepared the lesson on present continuous for the first time (video 1), she began by explaining the educational goals of the sequence, then she looked for resources in textbooks, and, finally, she searched for videos on YouTube. One year later, when she prepared the lesson for the second time (video 2), she dedicated a third of her time to reorganizing and adapting existing resources, a third to re-trace a video on YouTube, and the remaining one third to seek out complementary resources. In both videos, the action of selecting a resource occurred numerous times, and components of the scheme *selecting a resource* could be described.

In this case, the scheme *selecting a resource* is associated with the class of situations *prepare a lesson*. Regarding the intentional aspect, the main goal of this scheme is to choose resources that can respond to Audrey's information needs. These information needs, however, were not formulated directly. At the beginning of video 1 and video 2, Audrey explained the lesson's learning objectives (e.g., understand the difference between simple present and present continuous) and the type of resources she needed (i.e., authentic resources, an exercise sheet she had produced the previous year, or textbooks). Overall, she had an idea which kinds of resources she needed from these elements.

Regarding the generative aspect, rules of action, control, and information were deduced from the repetition of resource selection in the two videos. Corresponding to the ESP model, three steps were identified (see Fig. 2). The first step concerned the content of the resource. Audrey identified the content by reading the textbooks,

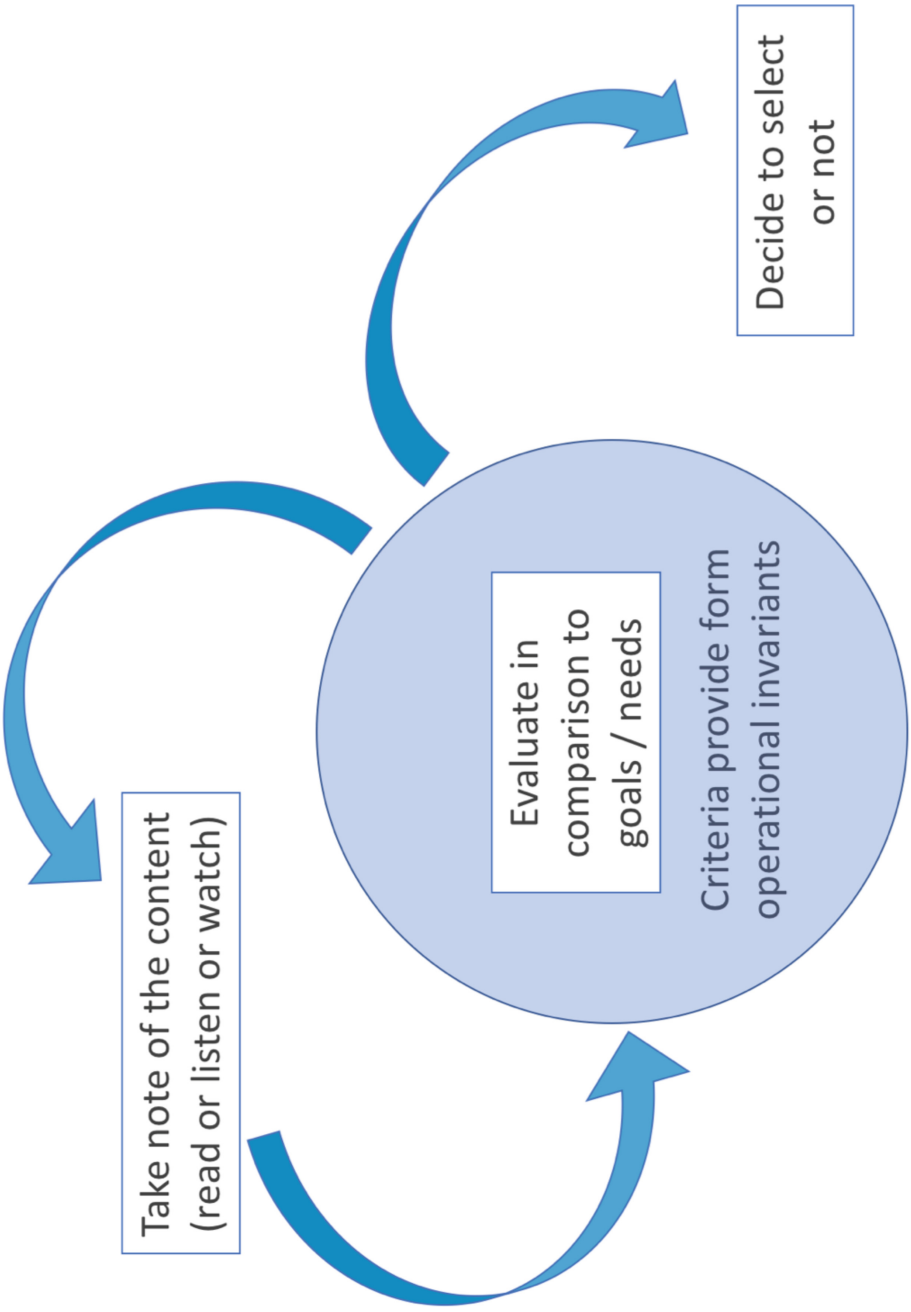

Fig. 2. Rules of action, control, and information (source: author).

listening to the audio tracks or watching the videos. This represented three inferences for the same scheme. While discovering the content, Audrey commented on what she was reading, listening to or watching. These comments are one possible way to evaluate the content in light of both the educational objectives and the teacher's information needs. Content evaluation was considered concluded in the moment when Audrey decided to keep or discard the resource. Resource selection depended on the value that Audrey attributed to each resource.

Audrey's arguments to justify her choice of educational media offer insight into operational invariants leading her actions. For example, Audrey looks for fun resources because she believes that fun improves student learning. Audrey considers this assertion valid and one that influences her choices. In addition, she also wants students to use the vocabulary acquired during previous lessons. Audrey considers this assertion to be a relevant influence of her choices as well. Both arguments are examples of operational invariants. Behind each argument found in Audrey's narrative, operational knowledge was identified and classified into five types: subject knowledge, didactic knowledge, knowledge of the curriculum, knowledge of students, and knowledge of the informational environment:

Subject knowledge covers all the knowledge regarding teaching content. For Audrey, this covers the English language (grammar, conjugation, pronunciation, vocabulary, etc.), and the Anglo-Saxon civilization. This category of knowledge helps her to select resources in light of the educational objective(s).
Didactic knowledge refers to progression (i.e., content taught before and after the sequence) or learning strategies (e.g., adapting exercises to educational objectives).
Curriculum knowledge comprises national (e.g., an audio extract must last less than 3 min) or European (Common European Framework of Reference for Languages) rules and guidelines. It also includes knowledge on textbooks, supplied curriculum resources, educational websites, such as *Audiolingua*, or other resources that Audrey usually consults.
Knowledge of students encompasses what Audrey learned by experience in class about students in general, and her sixth-grade group in particular (e.g., attention capacity, frequent difficulties, etc.). Along her personal career path, she developed beliefs, such as *students learn better if they have fun*.
Knowledge of the informational environment enables Audrey to act in the informational world. Knowledge of information sources is needed to access the right resource (e.g., YouTube to find a video or textbooks for an exercise) and can help her to ascertain the reliability of individual resources.

The interplay of these five types of knowledge is necessary to evaluate potential resources. As Audrey needs to consider a lot of constraints, she falls back on broad knowledge that is probably organized along a hierarchy of criteria to determine the value of each resource.

4.2 Role of Resource Selection for Pedagogical Design Capacity

In the first part of the findings section, the focus was on the professional knowledge involved in the resource selection process. This section will explore pedagogical design

capacity. When teachers prepare a new lesson, they design the plan, decide on content, progression, and assessment. Design processes transform teachers' ideas into materiality along the process of documentational genesis. Audrey's example illustrates both instrumentation and instrumentalization.

Instrumentation refers to the process where resources transforms Audrey's plans. After having begun her lesson preparation with the list of student learning goals, Audrey looked for audio material. She found a dialogue in the class textbook material. However, while she listened to it, she commented that the passage was adapted to work not only on present continuous, but also on personal pronouns. For this reason, she decided to add this new learning goal to her initial list. The folder containing all her materials indeed contained specific activities on personal pronouns. In this case, the interaction with the resource impacted the lesson planning process. Audrey adapted her lesson's educational objectives in such a way that the selected resource was used as profitably as possible.

The second process–*instrumentalization*–refers to teacher activities aiming at resource transformation. Audrey's documentation work illustrates this process. She selected the trailer of the movie *Ratatouille* on YouTube to add fun for her students to an oral activity of describing actions. The trailer is an authentic resource (i.e., not designed for teaching) prescribed by the curriculum standards. Initially, this resource was created with the business goal to promote the movie. Audrey added to it a learning objective and created an activity sheet to guide students in the comprehension of the trailer and the acquisition of the present continuous. Thus, she used the movie as learning material to describing actions.

Hence, the selection process illustrates the documentational genesis. In the first case, the resource moved Audrey to add an additional learning goal to her previous planning. The audio track is a curricular resource which originates from textbook material *(Round the Corner)*. However, the textbook task associates the audio track to both present continuous and personal pronouns. This is evidence that this resource was designed with specific learning intentions, which Audrey followed even being unaware of them while listening to the track. In the second case, the opposite thing happened, namely the teacher altered the educational resource. However, for this to happen, the resource must carry a certain potential. The main issue during the stage of resource selection is the ability to recognize the potentiality of a resource: What can I teach with the help of this resource? Answering this question depends on the knowledge mobilized in the scheme *selecting a resource*. Compared to the component of teacher design capacity, the expression of an intention and the reflection in action were identified in the stage of selecting a resource.

5 Discussion

The research described in this chapter bears some limitations. Firstly, the study presented in this chapter forms part of a doctoral project on the development of teachers' information literacy skills through the documentation work. For the purposes of this chapter, we isolated the stage of resource selection. However, this process is intertwined with the other tasks of the documentation work, which were excluded for the purposes of this chapter. Secondly, the results are based merely on one of the three case studies. Audrey's case study is not representative of all French teachers. However, she is a regular teacher, a

woman between 30 and 40 years of age, with around 15 years of teaching experience, and currently working in an average school. Thirdly, reflective investigation requires the full involvement of teachers. Teachers who agreed to be followed must remain involved for a long period of time and participate in data collection.

With these limitations in mind, the results described above show that five types of knowledge guide the teacher during the stage of resource selection. Furthermore, they also point revealed that the documentational genesis is implied in the teacher design capacity.

Regarding the types of knowledge guiding teachers during resource selection, we described the scheme *selecting a resource* for the class of situations *prepare a lesson*. Both Audrey's narratives and the observation of her actions on the recording enabled the deduction of rules of action, control, and information as well as the delimitation of operational invariants. The five types of operational invariants, which are knowledge in action, are knowledge of subject content, didactic knowledge, curriculum knowledge, knowledge of students, and knowledge of the informational environment. They enter the process of defining the goal of information retrieval and evaluation of each resource's relevance. Indeed, knowledge included in these categories is effectively used and transformed in action. For example, the use of a particular resource enriches Audrey's knowledge of this resource. The rules of action identified concur with the ESP model (Rouet and Tricot 1996). For the stage of resource selection, expertise implies knowledge linked to the teaching experience, content taught, and informational environment.

Research on interactions between teachers and resources (Pepin et al. 2013; Rocha et al. 2017) highlights the importance of the documentation work for professional knowledge, but leaves the question of information literacy, despite it being increasingly necessary to search, select, adapt, and transform resources in our digital world, unconsidered. Wang (2018) proposes to define documentation expertise for mathematics teachers as expertise in documentation work. This definition needs to be refined in light of the information seeking process. Furthermore, the majority of papers on teachers' interaction with resources focuses on science and mathematics teachers. A case study with an English teacher is the opportunity to test the conceptual tools of the documentational approach to didactics in a new subject field.

The results also highlight the dynamic nature of our model. Professional knowledge evolves with experience (Pastré et al. 2006). Despite several similarities, Audrey's two videos recording during the preparation of her lessons one year apart also bear an essential difference. While the first video showed Audrey searching for new resources, the second video contains actions of her checking the existing resources to confirm the selection made the previous year. She used her experience of preparing the lesson and its enactment with students to re-evaluate the resources deciding to keep, reject, or transform them. Davis et al. (2011) confirmed that teachers not only adapt teaching materials based on their students' knowledge. They also transform or enact teaching materials in a profound manner based on educational objectives. The example of documentational genesis given in this paper demonstrates, on the one hand, the dynamics of the resource selection process, and, on the other hand, the knowledge involved in the teacher design capacity. Pepin et al. (2017) defined components of teacher design capacity but not the knowledge that is involved in this. Thus, the knowledge identified for the stage of resource selection seems to help teachers in assessing a certain resource's potential and imagining its usage.

6 Conclusions

Resource selection is part of lesson planning. This stage gathers various kinds of knowledge. This study showed that five categories of operational invariants provide landmarks which help teachers to decide on the relevance of a resource. Relevance seems to be the driving force of teachers' resource selection. Regarding the design process, the formulation of an intention and reflection in action are shared points during resource selection. Moreover, the five categories of operational invariant also participate in the design process. Our results also illustrate the dynamics of this process, as teachers improve their knowledge while selecting resources for lesson designing.

Future research will focus on the results obtained from the remaining two observed teachers. The relevance criterion is expected to uncover knowledge that guides teachers when looking for information during lesson designing. While this chapter only considered the stage of resource selection, the other skills implied in information literacy (i.e., needs, selection, evaluation, and usage) are likely to have contributed to the construction on what was considered to be relevant. Defining the field of teachers' documentation expertise could help us better understand how teachers design their lessons and how this process bears upon their professional development.

References

ACRL (Association of College & Research Libraries), Framework for Information Literacy for Higher Education. (American Library Association (ALA), 2015), http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/Framework_ILHE.pdf

M.D. Alturkmani, P. Daubias, C. Loisy, A. Messaoui, L. Trouche, Instrumenter les recherches sur le travail documentaire des enseignants: le projet AnA.doc. Education & didactique **13**(2), 31–60 (2019). https://doi.org/10.4000/educationdidactique.3987

ACRL (Association of College & Research Libraries), Information Literacy Competency Standards for Higher Education (Text) (American Library Association (ALA), 2000). http://www.ala.org/acrl/standards/informationliteracycompetency

M.W. Brown, The teacher-tool relationship, in *Mathematics Teachers at Work: Connecting Curriculum Materials and Classroom Instruction*. ed. by J. Remillard, B. Herbel-Eisennmann, G. Lloyd (Routledge, New York, 2009), pp. 17–36

E.A. Davis, C. Beyer, C.T. Forbes, S. Stevens, Understanding pedagogical design capacity through teachers' narratives. Teach. Teach. Educ. **27**(4), 797–810 (2011). https://doi.org/10.1016/j.tate.2011.01.005

A.R. Diekema, W.M. Olsen, The notion of relevance in teacher information behavior. Proc. Am. Soc. Inf. Sci. Technol. **49**(1), 1–9 (2012). https://doi.org/10.1002/meet.14504901202

J. Dinet, A. Chevalier, A. Tricot, Information search activity: an overview. Revue Européenne de Psychologie Appliquée/Eur. Rev. Appl. Psychol. **62**(2), 49–62 (2012). https://doi.org/10.1016/j.erap.2012.03.004

G. Gueudet, L. Bueno-Ravel, S. Modeste, L. Trouche, Curriculum in France: a national frame in transition, in *International Perspectives on Mathematics Curriculum*. ed. by C.S.D. Thompson, M.A. Huntley (Information Age Publishing, Charlotte, 2017), pp. 41–70

G. Gueudet, B. Pepin, L. Trouche (eds.), *From Text to 'Lived' Resources. Mathematics Curriculum Materials and Teacher Development* (Springer, Dordrecht, 2012), https://doi.org/10.1007/978-94-007-1966-8

J.T. Guthrie, Locating information in documents: examination of a cognitive model. Read. Res. Q. **23**(2), 178 (1988). https://doi.org/10.2307/747801

MEN (Ministère de l'Éducation Nationale), Enquête PROFETIC 2016 (2017), http://eduscol.education.fr/cid107958/profetic-2016.html

A. Messaoui, Les pratiques informationnelles individuelles et collectives des enseignants d'un collège rural. Une enquête exploratoire (2016), http://www.spirale-edu-revue.fr/IMG/pdf/messaoui_anita_-_spiral-e_2016.pdf

S. Mizzaro, Relevance: the whole history. J. Am. Soc. Inf. Sci. **48**(9), 810–832 (1997). https://doi.org/10.1002/(SICI)1097-4571(199709)48:9%3c810::AID-ASI6%3e3.0.CO;2-U

S. Park, J.S. Oliver, Revisiting the conceptualization of Pedagogical Content Knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. Res. Sci. Educ. **38**(3), 261–284 (2008). https://doi.org/10.1007/s11165-007-9049-6

P. Pastré, P. Mayen, G. Vergnaud, La didactique professionnelle. Revue française de pédagogie. Recherches en éducation **154**, 145–198 (2006). https://doi.org/10.4000/rfp.157

R.T. Pedauque, *Le Document à La Lumière Du Numérique* (C&F editions, Caen, 2006)

B. Pepin, G. Gueudet, L. Trouche, Collaborative work with resources and teacher professional development, in: *Re-sourcing Mathematics Teacher Work and Knowledge: New Perspectives on Resource Design, Use and Teacher Collaboration*, ed. by B. Pepin (2013). https://hal.archives-ouvertes.fr/hal-01567270

B. Pepin, G. Gueudet, L. Trouche, Refining teacher design capacity: mathematics teachers' interactions with digital curriculum resources. ZDM Math. Educ. **49**(5), 799–812 (2017). https://doi.org/10.1007/s11858-017-0870-8

P. Rabardel, People and technology: a cognitive approach to contemporary instruments (2002). https://hal-univ-paris8.archives-ouvertes.fr/file/index/docid/1020705/filename/people_and_technology.pdf

K. de M. Rocha, L. Trouche, G. Gueudet, Documentational trajectories as a means to understand teacher's engagement with resources: the case of French teachers facing a new curriculum. Presented at the international conference on mathematics textbooks research and development (ICMT), Rio de Janeiro, Brazil, May 2017

J. Rouet, A. Tricot, Task and activity models in hypertext usage, in *Cognitive Aspects of Electronic Text Processing*. ed. by H. van Oostendorp, S. de Mu (Ablex Publishing, Norwood, 1996), pp. 239–264

H. Sabra, L'étude des rapports entre documentations individuelle et collective: incidents, connaissances et ressources mathématiques. Recherches en didactique des mathématiques **36** (1), 49–95 (2016). https://revue-rdm.com/2016/l-etude-des-rapports-entre/

L.S. Shulman, Knowledge and teaching: foundations of the new reform. Harv. Educ. Rev. **57**(1), 1–22 (1987)

G. Vergnaud, The theory of conceptual fields. Hum. Dev. **52**(2), 83–94 (2009). https://doi.org/10.1159/000202727

C. Wang, Mathematics teachers' expertise in resources work and its development in collectives: a French and a Chinese cases, in *Research on Mathematics Textbooks and Teachers' Resources*. ed. by L. Fan, L. Trouche, C. Qi, S. Rezat, J. Visnovska. IM. (Springer, Cham, 2018), pp. 193–213. https://doi.org/10.1007/978-3-319-73253-4_9

G. Gueudet, L. Trouche, Teachers' Work with Resources?: documentational geneses and professional geneses, in *From Text to "Lived" Resources*. Mathematics Curriculum Materials and Teacher Development, ed. by G. Gueudet, B. Pepin, L. Trouche. (Springer, Dordrecht, 2012), pp. 23–41. https://doi.org/10.1007/978-94-007-1966-8_2