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MULTIMEDIA CASES, TEACHER EDUCATION AND TEACHER LEARNING

Ellen van den Berg
University of Twente, Enschede, The Netherlands/Edith Stein Teacher Education College, Hengelo, The Netherlands
John Wallace
Ontario Institute for Studies in Education of the University of Toronto, Toronto, Canada
Erminia Pedretti
Ontario Institute for Studies in Education of the University of Toronto, Toronto, Canada

Introduction

The use of cases in teacher education is not a new phenomenon, with early records of case methods dating from the beginning of the last century. However, the rapid expansion of information and computer technologies over the past decade has influenced case construction and use in profound ways. Written cases are now being integrated with video and other textual forms to create sophisticated hypermedia case environments. Hypermedia (more commonly referred to as *multimedia*) case platforms provide the potential to incorporate various kinds of contextual, theoretical and pedagogical information into a rich and multi-layered representation of classroom teaching. In this chapter we explore the implications of these developments for teacher education and teacher learning. The chapter is arranged into four sections. In the first section we relate case methods to recent insights into teacher learning. Next, we examine the different types and uses of cases, followed by a review of the ways in which multimedia cases are being used in teacher education programs. In conclusion, we offer a short summary of the current evidence and future potential of multimedia cases for teacher learning.

Cases, Teacher Learning and Knowledge

What Are Cases and Why Are They Important in Teacher Education?

Three central notions appear to lie at the heart of the case idea. First, a case is based on a "real life" situation or event focusing on the particulars of that situation, while

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simultaneously taking a holistic view. Second, a case is assembled or constructed by careful research and study, typically involving the researcher in a series of descriptive and interpretive acts around a particular phenomenon. And finally, a case provides potential learning opportunities at various levels for those involved in the construction of the case and for those who may interact with the case.

It is this third notion – of cases as learning opportunities for teachers – that forms the focus for this chapter. Under this notion, cases are not just accounts of practice; they are created for pedagogical purposes. Hence, the design of the case – including the phenomenon selected, the issue highlighted, the contextual information included, the length of the case, the case medium and the supporting material – is directed towards providing learning opportunities for case users. Similarly, the conditions under which a case is constructed or used – such as the way the case experience is structured for the user and the interactions between case users, and users and facilitators – are considered from a pedagogical or instructional standpoint. The case and its surrounding pedagogical tools are sometimes referred to as the case method.

It is claimed that cases may serve a number of pedagogical purposes. One of the original categorisations was proposed by Shulman (1992), who building on his earlier (1986) work, suggested that cases might be used to:

– teach principles or concepts of a theoretical nature
– develop precedents for practice
– convey moral or ethical principles
– teach strategies, dispositions, reflection and habits of mind
– illustrate visions or images of the possible.

According to Merseth (1996), case purpose falls into three categories – cases as exemplars; cases as opportunities to practice analysis, the assimilation of differing perspectives, and contemplation of action; and cases as stimulants to personal reflection. These three types – exemplar, analytic and reflective – are analogous to Cochran-Smith and Lytle's (1999) notions of promoting knowledge-of-practice, knowledge-for-practice and knowledge-in-practice and Wallace's (2001) notions of primary, secondary and tertiary use of cases (see later).

From Written via Video to Multimedia

In discussions about cases and case-based learning, advantages of a video above a written format are articulated. Video cases offer non-verbal signals and immediacy not possible in narrative cases. Students may eyewitness teaching practices that approximates being actually present in the classroom. For this reason, video cases provide a more open ended, less cued representation of practice. Moreover, video cases capture the complexity of teaching and the simultaneously occurring events in the classroom far better than do written cases. Watching and discussing a video case is perceived as a more authentic and meaningful learning experience than is reading a narrative case (Clarke and Hollingsworth, 2000; Derry, et al., 2002). However, not all sources point to the significance of video above written cases. Brophy cites from Baker's (1970) meta-analyses of film and video use in teacher education: "One

conclusion was that teachers in general and novices in particular usually do not gain many new insights or ideas about improving their teaching from simply watching classroom videos. If they do not have a clear purpose and agenda for viewing the video, they are likely to watch it passively, much as they might watch a television program. A further concern is that video cases do not have the contextual and background information and the reflective comments that may easily be included in the story format of a narrative case (Sherin, 2004).

This drawback may be overcome by embedding video cases in a hypermedia environment: multimedia cases. A multimedia case provides a richer and more layered picture of classroom teaching. Moreover, hypermedia programs provide teachers with the opportunity to access video in different ways. There are usually multiple starting points and multiple paths that a user can take to explore the data provided. The application of computer technology enables for cases to be learner-controlled. They may pace learning according to personal needs. A wide range of different content may supplement the video. For example, reflections from various persons (teacher in the video, teacher educators, prospective teachers) offer extra lenses to view the video. Context information about the teacher's educational philosophy, the school or student work samples provides for a framework to interpret the events on the video. Hyperlinks to all kinds of information may be added to the video such as lesson plans, teaching tips, conceptual information about the content of the lesson, underlying principles from learning psychology and so on.

With this rich array of additions multimedia cases rise above the critique on both written and video cases that they portray a too shallow representation of what classroom teaching is about. However, from a perspective of teacher learning there are still challenges. Salomon and Almog (1998) refer to the "butterflying defect" as a metaphor to characterize learning behaviour in hyperlinked environments. Learners act like a butterfly hovering from item to item without really touching them. Studies of multimedia cases in teacher education underpin this effect: many students zap to the different components of a multimedia case and the intended deep processing of the information in this learner-controlled environment does not occur (Blijleven, 2005; van den Berg, 2001; Williams, 2004). Therefore, multimedia cases need to be carefully embedded in teacher education and professional development programs.

Enhancing Teacher Learning Through Cases: How Are Cases Related to Theories about Teacher Learning?

There is a growing body of evidence that effective teacher learning is situated in the complexity of professional practice (Putnam and Borko, 2000). In making judgments in pursuit of multiple goals on behalf of learners with diverse needs, teachers simultaneously act upon several different problems in a single action. However, when prospective teachers enter teacher education programs, they have little awareness of this complexity. Years of "apprenticeship of observation" (Lortie, 1975) have an enormous effect on the preconceptions that teacher candidates bring to the task of becoming a professional. Addressing these preconceptions and helping students to "think like a teacher" is, therefore, a fundamental goal of teacher education.

However, future teachers are not only asked to *think* like a teacher, but also to put what they know in action, that is, to *act*. To enact what they know, teachers require a deep foundation of factual and theoretical knowledge organised in coherent conceptual frameworks, and the practical experience to make this knowledge productive for learners. Moreover, teachers need to develop meta-cognitive habits of mind that can guide decisions, to *reflect* on practice in support of continual improvement and to *transfer* their learning to other settings.

Think

Learning to think like a teacher means replacing the "apprenticeship of observation" (Lortie, 1975) with another form of apprenticeship learning: cognitive apprenticeship. Cognitive apprenticeship supports learning in a particular domain by enabling teacher candidates to acquire, develop and use cognitive tools in authentic domain activities (Brown et al., 1989). The word cognitive emphasises that this type of learning goes beyond learning by observing actions. It is about using the tools that enable these actions. In teaching this also implies gaining insight in the reasoning behind the actions.

Anchored instruction provides a model for creating problem contexts that allow students to see the utility of knowledge and to understand the conditions for its use. Multimedia cases are a means to anchor teacher learning in the complexity of practice (Bransford et. al., 1990). The case format represents professional practice in a way that promotes the experiential nature of learning. Picturing professional knowledge as a sequence of events or a story serves as a vehicle for remembering, learning and understanding. However, as noted earlier, learners require support to gain the full educational potential of multimedia cases. Future teachers are asked to develop the ability to notice and interpret what is happening in a classroom (van Es and Sherin, 2002). In other words, teachers need to learn to identify what is important in the teaching situation, to make connections between specific events and the broader principles of teaching and learning and use what they know about the context to reason about a specific situation. Multimedia cases provide a learning environment in which this "interpretative stance" can be learned, because it contains an authentic situation in the form of a video of classroom practice. Embedding the video in a multimedia learning environment that contains additional theoretical and contextual information, assignments or directions to a specific aspect of the lesson pictured may help future teachers to think and to reason "as a teacher."

Act

Interpreting the events depicted in multimedia cases is a precursor to adapting and enacting those ideas in the classroom. Exemplary cases represent a class of cases in which future teachers might learn from good practices of experienced teachers. Such cases are used to illustrate a principle or procedure. An expert teacher acts as a model of excellent instruction or innovative practice (Clarke and Hollingsworth, 2000).

Contrary to acting or observing in real classrooms, video technology offers the possibilities of reviewing the "model" teacher. Moreover, a multimedia environment

includes the opportunity to scaffold the learning of the principle or procedure by providing insight into the cognitive processes of expert teachers and other types of advice and information. In other words, multimedia create a multi-layered representation of teaching practice that helps teachers learn from excellent practice with the intention to enact these practices in real classroom situations. This type of learning with multimedia resembles a classical transfer model that emphasises the correspondence between the conditions of learning and the conditions of the transfer situation (Mayer and Wittrock, 1996). The case representation is a means of narrowing the gap between general knowledge about principles and procedures, and enactment in real classrooms.

Reflect

Reflection is a key concept in teacher learning and professional development. Two types of reflection are often distinguished – reflection-in-action, which refers to cognitive processes controlling rapid activity in-the-moment, and reflection-on-action as a deliberative process occurring outside of action (Schön, 1983). The latter type of reflection may also be viewed as critical thinking, whereas the former refers to split-second behaviour in which it is hardly possible to distinguish between perception, interpretation and reaction. Those immediate actions embody the heart of daily teaching activities. Determining how pre-service teachers may acquire an adequate repertoire of these kinds of actions is core in teacher education.

Korthagen and Kessels (1999) address this question by proposing a "level approach" to teacher learning that is grounded in practice. Gestalt psychology, the discipline that studies how people see and understand the relation of the whole to the parts that make up that whole, is central in their approach. The first level consists of the formation of a *gestalt* – or what van den Berg (2001) calls an *image* – based on experiences with concrete examples. In a multimedia case, this image (or gestalt) is connected with the concrete situation depicted in the video in a multi-layered way, and restricted to certain characteristics of this situation. An essential characteristic of an image is its implicit or tacit character. Reflection on images leads to more "aware" levels in which mental networks are constructed by practical (level 2) and theoretical (level 3) reasoning. Contrary to *in situ* classroom teaching, video cases have unique features to facilitate this sense making process because they can be viewed over and over again by a great number of people (both face-to-face and virtual).

One of the most remarkable differences between classroom teaching and watching a video is that the latter does not ask for immediate action. In the absence of the immediacy of action, teachers have the time to intentionally make sense of the images formed out of their experience of watching the video. This sense making is facilitated by the additional "add-ons" of multimedia cases (part of what might be called the case method), which serve to further stimulate teachers' reflection through discussion and consideration of alternative perspectives. Reflecting, discussing and considering different perspectives result in mental recordings of the images of the video footage in comprehensive reasoning. This type of teacher knowledge, teacher practical theory, is rooted in practice and is no longer implicit because of its verbal articulation.

Transfer

While teacher learning is generally associated with transfer to professional practice, Cognitive Flexibility Theory (CFT) takes transfer as a key concept. CFT holds that the goals of advanced knowledge acquisition in ill-structured domains must include flexible and adaptive knowledge transfer (Derry et al., 2002). This theory is about preparing people to select, adapt and combine knowledge and experience in new ways to deal with situations that are different from those previously encountered. Transfer is particularly important in teaching because teachers typically work with many students at once and have to juggle multiple goals. Many teacher education approaches fail because they represent this complexity in an unrealistic and simplified manner. According to Derry et al. (2002), learning to teach through oversimplified representations may contribute to later flawed reasoning in practice. Multimedia case methods may address this concern by offering an environment in which teacher learning is embedded in the complexity of practice and in which learners are encouraged to build multiple understandings of cases and use concepts repeatedly in case analysis. Derry et al. (2002) claim that multimedia cases enable opportunities for future teachers to employ important foundational principles that are unlikely to be encountered during limited field placement or even in the first years of teaching.

A Typology of Multimedia Cases: Primary, Secondary and Tertiary Use

Multimedia cases operate like a *chameleon* in the way that they easily adapt to different learning purposes and theories. A powerful means of thinking about cases and pedagogical purposes, incorporating the goals of building knowledge-of-practice, for-practice and in-practice, is to consider multimedia cases in terms of three different types of uses – primary, secondary and tertiary (Wallace, 2001).

Primary Use

The first type is called *primary* use of multimedia cases. According to Wallace (2001), primary use may involve a participant in the direct construction of the case. Here the case becomes a video story, used by the participant as an adaptation to enrich her or his understanding of the events described (Sykes, 1996). A case, under this conception, is seen as "a point on an array of interconnecting and largely disjointed and indeterminate understandings of what it means to teach" (Carter, 1999, p. 174). Typically, primary use involves the participant teacher in videotaping his or her own teaching and constructing (and sometimes presenting) the accompanying case. It is argued that primary involvement in cases most closely matches Schön's (1983) notion of problem setting or framing, whereby the practitioner names the things to attend to and frames the context in which to attend to them.

While primary case use is more easily accomplished in narrative formats, there is an increasing recognition of the importance of including teachers in the development (and use) of multimedia cases. Rather than seeing teachers as simply "video objects," primary use recognizes the teacher as a central figure (and learner) in the construction process. For example, Rosaen et al. (2004) describe the rich learning benefits obtained by a group of literacy teachers when they were involved in the (co)construction of a set of video cases of their own teaching. The participating teachers reported that the project affirmed the value of their work. They appreciated the opportunity to discuss literacy teaching with their peers and noted practical ideas to introduce in their own classroom. Louden et al. (2001) showed how a group of experienced science teachers collaboratively developed a set of multimedia cases of their own teaching to illustrate and facilitate rich discussion of teaching standards. In a similar vein, Sherin and Han (2004) described how middle school mathematics teachers developed "professional vision" by meeting in a monthly video club to watch and discuss excerpts of videos of their classrooms. In another variation on primary use, Beck et al. (2002) reported on a project where pre-service elementary teachers constructed their own multimedia case studies of their mentor teacher's classroom and incorporated analyses of the mentor teacher's strategies, student learning or understanding, teacher–student interactions, student–student interactions and professional standards.

Secondary Use

As Wallace (2001) explains, under *secondary* use of cases, the participant interprets a finished case through the lens of her or his own experience. However, under secondary use, the experience of the case user is accorded less authority than the case itself. The interpretive act is linked to evidence provided by the various media – through events emphasized, downplayed or omitted, accompanying "expert" commentaries, implicitly or explicitly stated theories, focus questions or standards of instruction. That is, the multimedia case – imbued with layers of propositional knowledge – is employed as more a method of direct instruction or exemplification than it is a profound experience for the user.

Secondary case use is perhaps most prevalent in pre-service teacher education settings. Abell et al. (1998), for example, developed a set of multimedia cases of teaching elementary science for conceptual change. The case materials were used in elementary teacher preparation programs to provide a kind of "field experience" with exemplary science teachers. Similarly, Baker (2005) reported that multimedia case-based instruction provides meaningful experiences to pre-service teachers, and may potentially enhance field experiences. Maloch and Kinzer (2006) explored the influence of multimedia cases in pre-service literacy methods courses by following a set of pre-service teachers into their first years of teaching. Bliss and Reynolds (2004) used what they call "video docucases" (a form of exemplary cases) with pre-service teachers as a means of illustrating teaching standards. They claimed that this method increased their students' comprehension of the standards, contributed

to their enculturation into the world of quality teaching and helped create visions of themselves as teachers.

Tertiary Use

The final use of cases is termed *tertiary* use. As Wallace (2001) explains, during tertiary use the case provides a leitmotif for the reader's or viewer's interpretive act. Here the reader's experience and perspective takes precedence over the knowledge held in the case. The case is used as a trigger for discussion and exploration, rather than a standard against which to judge the viewer's response. Tertiary-use cases typically are more dilemma than exemplar-focused, used to open debate rather than to close it down, inviting layer-upon-layer of different users' commentaries on the case. Sykes (1996) calls this a strong use of cases, whereby interpretation of the case is a creative experience, constructed more or less independently of the case itself.

The difference between tertiary and secondary use of cases is subtle. Often both uses are evident in the same project, as users move to higher levels of interaction with the cases. The essential difference between the two, however, is that tertiary use has more to do with the user's experience and practice than with the practices illustrated in the case itself. Many case projects address this issue directly. For example, Hewitt et al. (2003) attempted to personalize video case methods by focusing pre-service teachers more directly on their own pedagogical decision-making processes. In a mathematics teacher education project, Masingila and Doerr (2002) found that multimedia cases helped student teachers to frame many of the issues that they encountered in their own practice (such as checking for student understanding and the use of questioning). In a kind of meta example, Doerr and Thompson (2004) described how four teacher educators adapted their own instructional practices by observing and trying to understand how their pre-service secondary teachers attempted to make sense of teaching by studying a multimedia case.

These three uses of multimedia cases – primary, secondary and tertiary – offer different balances among the case narrative and user experience, theory and practice, and the users and developers of cases. They are also likely to result in different balances among thinking, acting, reflecting and transferring. The key issue appears to be whether or not professional knowledge is considered to reside *in the case* or is brought bear *on the case* (Sykes, 1996). There is no hierarchy intended here – primary, secondary and tertiary uses of cases often overlap and intersect. Multimedia cases can be created by primary participants, and then interpreted by different groups of participants for secondary or tertiary purposes. Tertiary case use can also lead to primary use as participants tell their own stories or video their own classes in response to a case. The framing of the case is important – open-ended cases are more likely to produce tertiary conversations than are closed cases. But, we also know that the same case can be interpreted in lots of different ways, depending on how the conversations are framed and facilitated (Doerr and Thompson, 2004), and the experience of the users (Wallace and Louden, 2000).

Anchoring Multimedia Cases in Teacher Education Programs

While multimedia cases clearly carry great promise for teacher education, they do not, as Shulman (1992) reminds us, teach themselves. As Brophy (2004) suggests, simply watching classroom videos is unlikely to improve pedagogy, or stimulate new ideas and insights about teaching and learning. Whether they are used in the primary, secondary or tertiary sense, multimedia cases and associated case methods need to be carefully constructed in order to reach their full potential. We argue that effectively anchoring multimedia cases in teacher education programs involves several considerations – intentionality, creating context and scaffolding, quality conversations and praxis.

Intentionality

Multimedia cases are intended to provide learning opportunities for users. They need to be carefully designed and created for pedagogical purposes highlighting particular phenomena or issues. Therefore by setting clear intentions and agendas a number of purposes can be served. First, they allow users to situate teaching cases within a broader discourse about teaching and learning while simultaneously focusing on the particulars of a case. For example, Lampert and Ball (1998) used video to illustrate the development of students' mathematical knowledge and lesson participation over time. The theoretical framework that underpins the work of Bencze et al. (2001, 2003, in press) includes teaching and learning about the nature of science; science, technology, society and environment education; technological design; and scientific inquiry. Second, a clear purpose for the case presents a focal point for case users, and stimulates opportunities for rich discussion, analyses and reflection, that might otherwise be missed. Third, multimedia cases can provide openings to expose pre-service students to alternative practices and frameworks in education (Marx et al., 1998). For example, Wong et al. (2006) used multimedia cases to demonstrate a range of non-traditional teaching practices such as hands-on practical work, encouragement of pupil talk and the infusion of nature of science, while Pedretti et al. (2008) developed a case to teach explicitly about science, social justice and socio-political action.

Creating Context and Scaffolding

One of the great strengths of multimedia cases is the rich context they depict – visual cues, subtle classroom nuances and the complexity of the classroom. They present teaching episodes in rich, authentic real-life settings and provide teacher candidates with the opportunity to examine in detail the planning of a lesson, its delivery and the reactions of both teacher and students as the lesson unfolds. However, as stand-alone experiences, multimedia cases can be ineffective. Brophy (2004, p. xii) writes about the "disappointing results" when student teachers were allowed to use the videos in whatever way they wished. Similarly, self-guided inquiry into student teachers' own questions without much guidance or direction proved to be unsatisfactory. It is clear that the pedagogical apparatus that accompanies the case – the case method – is a

significant part of the user's experience with the multimedia case. Just as the case itself is contextualized, so must be the use of the case.

A number of strategies to scaffold students' progress towards intended goals have been cited in the literature. Examples include developing focused viewing guides or activities for pre-service students to use while viewing the case (Bencze et al., 2003; Brophy, 2004), or suggesting how the case might be viewed multiple times for multiple purposes (Friel and Carboni, 2000). Most effective is the use of multimedia case methods in tandem with other supporting materials and activities such as readings related to the featured aspects of teaching, pre- and post-instructional strategies, written responses to readings and to the case, in-class discussions, examination of appropriate curriculum documents and post-case discussions (Pedretti et al., 2008; Tippins et al., 1999). Finally, the video case itself can be supplemented, through hyperlinks, with resources such as lesson plans, assessment and evaluation tools, examples of students' work, student interviews and teacher interviews.

Quality Conversations

The notion of "quality conversations" (Wallace, 2003) is central to the effective use multimedia cases. Embedded in a rich landscape of teachers' stories and practices, cases carry the potential to generate quality dialogue between educators and teacher candidates. In other words, multimedia cases provide "a leitmotif for the [viewer's] interpretive act" (Wallace, 2001, p. 186), a place from which conversations spring.

Constructing contexts for quality conversations is central to effectively anchoring multimedia cases in teacher education. Providing guiding questions, tasks and activities to be completed while viewing the case, and conducting post-viewing group discussions assist in promoting quality conversations. Pre-service students are also encouraged to work in pairs or small groups (see Abell and Cennamo, 2004; Brophy, 2004) as a way of stimulating discussion. In in-service situations, teachers are provided with opportunities to talk about their own teaching, but usually within a context of some framework or theme. In an innovative use of multimedia cases, Pedretti et al. in press invited the onscreen teacher, Anna, to participate in a class discussion as teacher candidates viewed the case. Anna's presence in the class allowed student teachers opportunities to ask her questions, comment and reflect on what they had seen in the case.

Praxis

Multimedia cases give teachers powerful insight into what it is like to "be there." However, "videos can never fully replicate the complexity of working in a real classroom because the student teacher herself/himself is only present as a distant observer" (Wong et al., 2006, p. 6). How then might multimedia cases be used to narrow the gap between general knowledge about principles and enactment in classrooms, between theory and practice? Possible strategies include providing teacher candidates with opportunities for personal reflection and practice within a teacher education program (Abell and Cennamo, 2004; Wong et al., 2006).

For example, the use of cases by Hewitt et al. (2003) included opportunities to practice analysis. The video was stopped at various points in the lesson where the teacher was faced with an unexpected decision or challenge, and pre-service candidates were asked to describe to their partner how they would respond in that situation. Other strategies cited in the literature include providing small-scale opportunities for teacher candidates to design and implement curriculum with their peers or with children in schools through micro-teaching, workshops and class activities (see for example, Bencze et al., 2008; van den Berg et al., 2004). In summary, experiences for teacher candidates can be enhanced through close association with highly personalized and contextualized teaching and learning situations, and by providing opportunities to personalize knowledge, theoretical orientations and practices.

Conclusions

In summary, it is clear that the multimedia case movement is in a high and healthy state of experimentation, invention and eclecticism. Primary, secondary and tertiary case use is in evidence internationally, in a range education settings (pre and in-service), foci (content and pedagogical content knowledge, classroom and school relationships, ethical issues), media (video, accompanied by commentaries and other artefacts) and uses (teacher preparation, professional development, teacher certification and evaluation, exemplification of curriculum and teaching standards).

As we have seen, there is a growing literature on the learning processes that are evoked by multimedia cases and on the use of these cases as learning opportunities in teacher education. This work is likely to proceed apace as information and computer technology capability and use continues to expand. While there is clearly much excitement and some promising lines of research, we should also sound a note of caution. For the most part, the multimedia case literature is still largely advocacy-based. With a few notable exceptions, some of which have been discussed in this chapter, the evidence for learning is frequently in the form of interesting experiences and conversations around case construction and interpretation rather than classroom praxis. There are also questions about whether multimedia case methods are substituting representations for context immersion, and whether users can learn from cases without having contributed to the selection and framing of the case. In other words, what is the link between doing cases and doing teaching, between thinking, acting, reflecting and transfer? Further questions are also emerging about the myriad of ethical issues surrounding multimedia case construction and use, and whether the underlying pedagogical purposes of case use are being lost in the "technology hype" surrounding the development of new media. While video and multimedia offer increasing possibilities for representing and accessing images of teaching in new ways, it is important to stay focused on the core issue of how these new media forms can be embedded in effective case methods, that is, how can they be used to promote teacher learning.

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