A selection of point of view camcorders: Technical specifications, classroom trials, and potential applications

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Since their introduction in the late 1950s, video cameras have become a standard tool for both instructional and research applications in education (Derry, 2007). Undergoing a great number of technological advancements—including increased portability, quality of recording, and ease of use—large stationary units eventually gave way to compact handheld camcorders in the mid-80s (Diehl, 2011; Shapiro, 2010). Even with their reduced size and portability, modern camcorders attached to a variety of stationary mounts remain popular for exploring teacher instruction (Nunan, 1990), interactional feedback (Mackey, 2002), teacher evaluation (Klapper, 1991), and the like. Alternatively, these portable camcorders have been used in the hands of an operator to effectively research, for example, student affect during activities (Spielmann & Radnofsky, 2001), individual students or dyads in the same class (Nabei & Swain, 2002), and classroom dynamics (DuFon, 2002). Because both stationary and handheld camcorders provide only a non-participant point of view of classroom events, some researchers have employed several camcorders simultaneously in an attempt to overcome these limitations (Hellerman & Cole, 2008; Rosenstein, 2002). Even with multiple camcorders, however, capturing a participant point of view—what the participant sees—remains elusive. This is because the recordings, albeit from multiple locations, are still limited by an obtrusive, observer's distance (Gredler, 1995).

This situation changed in 2005, when reasonably priced point of view (POV) camcorders came on the market (Berra, 2010). The subsequent interest in using POV camcorders in educational settings (Hargis & Marotta, 2011; Rowell, 2009) is due in large part to the keen competition between producers, which has driven technological advancements: the reduced size and weight, improved quality of both video and audio recordings, a widening frame of capture, decreased size and increased capacity of memory cards, longer battery life, and simplicity of use.

Particularly aimed at the youth, young adult, and outdoor sports markets, a number of companies, including 1) i-Kam Optics® (2011), 2) Looxcie® (2011a), 3) Apple® (2011), 4) GoPro® (2011), 5) Contour® (2011), and 6) Drift Innovation® (2011), have developed products in a variety of designs and with a variety of functions (see Figures 1~6 below). Though the devices differ greatly in design and function, the main advantage of all POV camcorders is that they help overcome the principal shortcoming of stationary and handheld units, capturing a close approximation of what the wearer actually sees and hears while *participating* in events. With POV recordings, athletes essentially become proxies, helping others to "experience the action" (Grossman, 2008, p. 157). Similarly, students can become proxies, helping educators to "see through their eyes" (Kindt, 2011).

Figure 1: i-Kam Xtreme

Figure 2: Looxcie LX1

Figure 3: Apple iPod Touch with HatCam

Figure 4: GoPro Hero

Figure 5: Contour+

Figure 6: Drift HD

It is important, for the purpose of this paper, to differentiate between a *participant point of view* and a *participant perspective.* The participant point of view is "objective," the "position from which something is observed" ("point of view," n.d.). Following this definition, it is the raw video footage that—relying on head movement, not eye movement—approximates what a participant sees. A participant perspective, in comparison, involves not only what a participant sees, but includes a "subjective evaluation" ("perspective," n.d.). A *truly* participant perspective, however, is impossible to achieve, even with a POV camera. POV recordings, when combined with participants' subsequent guided reflection (Land & Zembal-Saul, 2003), can only provide a closer approximation. The POV camcorder, therefore, should be seen as a tool to assist educators in working towards *a better*

understanding of the participant perspective and not offering a *truly participant perspective*. Considering the benefits of capturing video from the participant point of view—and understanding the potential to move towards a deeper understanding of participant perspectives—the purpose of this paper is to present a selection of popular POV camcorders that are finding their way into educational settings. This paper also summarizes the designs, essential functions, and basic technical specifications of those camcorders, and introduces a number of possible procedures for use in developing materials, implementing activities, and conducting research in language classrooms.

Since technological advancements happen rapidly and model upgrades are frequent, this report examines only 6 of the dozens of camcorders available—one from each of the companies mentioned above—that were trialed in the author's English oral communication and seminar courses in the 2010 to 2011 academic years. Because of an interest in interaction and the development of strategic competence in instructed language learning, the author was seeking a camcorder that would provide a participant point of view with clear audio recordings of both the wearer and his or her partner. Much research has been conducted using camcorders in laboratory settings (Hindmarsh, Heath, & Luff, 2010), but to move toward more accurate descriptions of student experience, data should be captured in a natural setting (Goodwin, 2009), currently a more realistic possibility using POV camcorders. Furthermore, since students receive English instruction predominantly in classrooms, it is relevant to increase our understanding of how students tend to interact in English to promote more effective learning.

Technical specifications

As previously mentioned, amid the growing popularity of extreme sports, camcorder suppliers have worked quickly to provide products that offer quality video and audio with adequate memory and battery life while being light, easy to operate, reliable, and inexpensive. These include models worn as glasses, over one ear, on a baseball cap, or on the head—either to one side (side-mount) or centered (head-mount). All POV camcorders record a close approximation of what the wearer sees, but each of these units, from the inexpensive i-Kam Optics video glasses to the more sophisticated Contour+ with GPS and Bluetooth connectivity, excel in particular areas and are limited in others. Even the state-of-the art Drift HD (released October, 2011) and GoPro Hero 2 (released December, 2011) will require further technological development to be ideal for POV video capture in the language classroom.

The technical specifications for the 6 cameras described in this report—the 1) iKam, 2) Looxcie, 3) Touch, 4) GoPro, 5) Contour, and 6) Drift—are listed in Table 1, followed by a description of classroom trials and possible future applications.

Table 1: Basic camcorder technical specifications

Company	Model	Type	Video (best)	File	View (best)	Finder	Memory (GBs)	Battery (hours)	Weight (gms)	Price (US$)
1. i-Kam	Xtreme	glasses	736x480	avi	67˚	none	4+8	2.5	40	$99
2. Looxcie	LX1	over ear	640x480	mp4	62˚	Bluetooth	4	4	28	$119
3. Apple	Touch[1]	HatCam	720p HD	mp4	60˚	screen	64	7	101	$399
4. GoPro	HD Hero	head-mount	1080p HD	mp4	170˚	optional	32	2.5	179	$299
5. Contour	+[2]	side-mount	1080p HD	mov	170˚	Bluetooth	2+32	2.5	150	$499
6. Drift	HD[2]	side-mount	1080p HD	mov	170˚	screen	32MB+32	4	138	$369

[1] Worn mounted on a HatCam.
[2] Compatible with an external microphone.

As Table 1 indicates, the specifications for the 6 camcorders vary greatly. The lower-cost units, the i-Kam Xtreme and Looxcie LX1, lack a wide, 170˚ view and high-definition (HD) resolution. If the quality of visual aspect is not particularly important for the researcher, the relatively low resolution may not be an issue. What is important in exploring the language of classroom interaction, however, is the quality of sound, especially the speech of the wearer and his or her partner. In the list of 6 camcorders under study, only the Drift HD and Contour+ have a plug-in for an external microphone, an essential accessory for clear audio. These and other specifications are explored in the following section.

Classroom trials

1) i-Kam Xtreme video glasses

The i-Kam glasses are relatively inexpensive, easy to wear, and take little effort to pass from one wearer to another (see Picture 1). The video/audio quality, however, is low and the field of capture only 67 degrees (Screenshot 1). Furthermore, since trials were conducted in two consecutive 90-minute classes, the 2.5-hour battery life was too short, leaving the second recording incomplete.

Picture 1: An oral communication student wearing the i-Kam Xtreme video glasses

Screenshot 1: From the i-Kam Xtreme video glasses

The i-Kam was effective in helping increase the teacher's and students' awareness of classroom dynamics, in this case, emphasizing positive interaction and general levels of engagement. When the classroom was relatively quiet, the i-Kam could capture the teacher's instruction reasonably well. When students were engaged in speaking tasks in dyads, however, much of the partner's utterances were incomprehensible. With the glasses, probably due to the relative ease in changing, students passed them to other wearers frequently, 5 to 6 times per 90-minute period, without encouragement from the teacher. One advantage of having multiple wearers was that more students were involved. A single wearer, however, would offer more consistency, useful when exploring, for example, progress in recursive practice (Kindt, 2005).

Though not possible to wear over glasses—eliminating students who wear glasses from potential wearers—the i-Kam glasses may be practical for programs hoping to record in dyads or small groups in a quiet area because of their low cost. When using the glasses in back-to-back sessions, however, the limitations of the battery may require teachers to choose relatively short activities to capture. Alternatively, a second pair of the relatively inexpensive glasses could be used.

2) Looxcie LX1

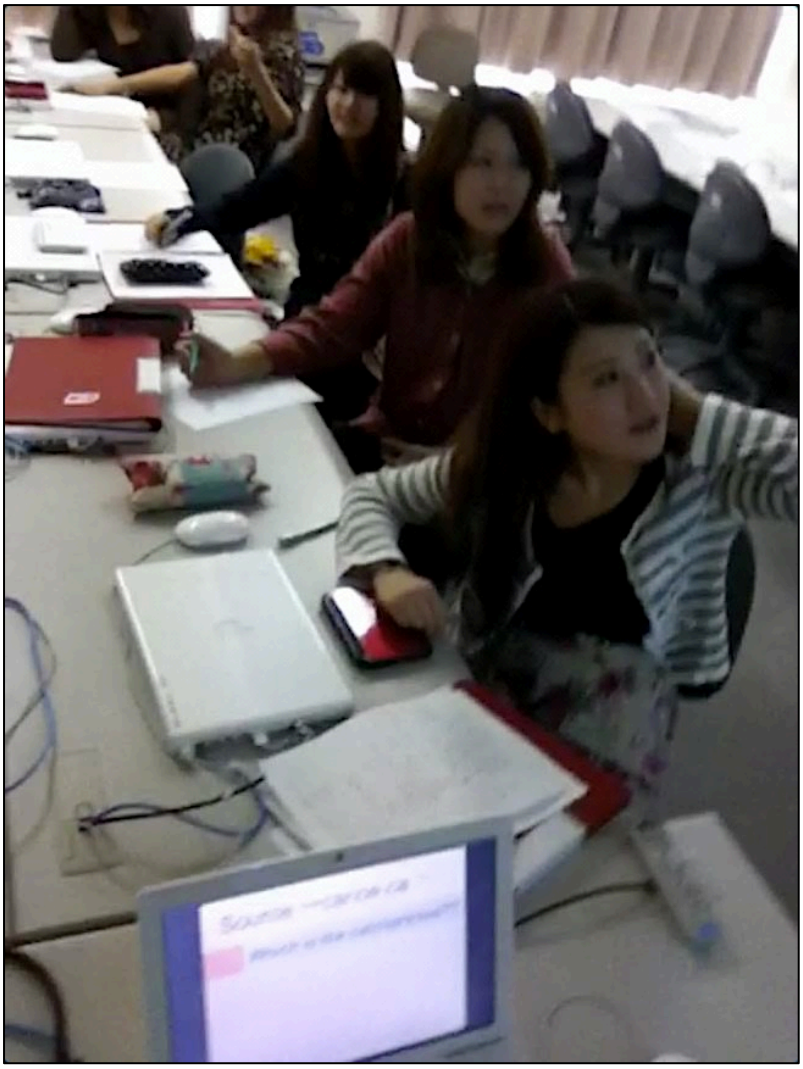
The Looxcie over-the-ear camcorder is light and comfortable to wear. Unfortunately, the Looxcie LX1 is designed to fit primarily to one wearer, making it difficult to change wearers. Aiming accurately is made more problematic without an onboard viewfinder. Although it has the capability to connect to smartphones, the process is cumbersome. Currently Looxcie sells an improved model, the Looxcie LX2 (Looxcie®, 2011b), which is easier to fit to different wearers and has double the recording capacity. In classroom applications, the difficulties related to fitting the Looxcie LX1 on wearers' ears resulted in recordings that were not useable. The improved model may offer better quality with improved wear-

ability.

The Looxcie does have an integrated earphone, which allows the wearer to hear audio from a smartphone or similar device. This may have potential for real-time guidance from a teacher or another student, an interesting avenue for near-peer modeling. There also may be some potential with Looxcie Live®, a system currently being developed by Looxcie for streaming POV video footage in real-time onto a smartphone, the Internet, or a TV.

3) iPod Touch with HatCam

The iPod Touch (or iPhone) is, like the i-Kam glasses, easy to wear and change from one wearer to another. Because the mount is on the brim of a baseball cap (see Figure 3, above), changing wearers is as effortless as changing a hat. Though the Touch itself is relatively expensive, teachers may already have them for different purposes. Using Hatcams, it may also be possible for students to use their own devices. The HatCam and mount is inexpensive, retailing for US$24.99 (Hatcam®, 2011). The shortcomings of the Apple iPod Touch or iPhone with the Hatcam—similar to the i-Kam and Looxcie—are the relatively low quality of video and limited sound capture away from the wearer. Used in trials to capture student presentations in a seminar class, the iPod Touch with HatCam was effective in giving students a general impression of what the wearer sees (Screenshot 2). During one presentation, the presenter wore the HatCam. In another presentation, a student watching the presentation wore the HatCam, giving a perspective from the audience (Picture 2). Both recordings gave the teacher the opportunity to edit parts of the presentations to show in subsequent classes. Though from different points of view, each recording contributed to student awareness of two sides of the presentation experience.



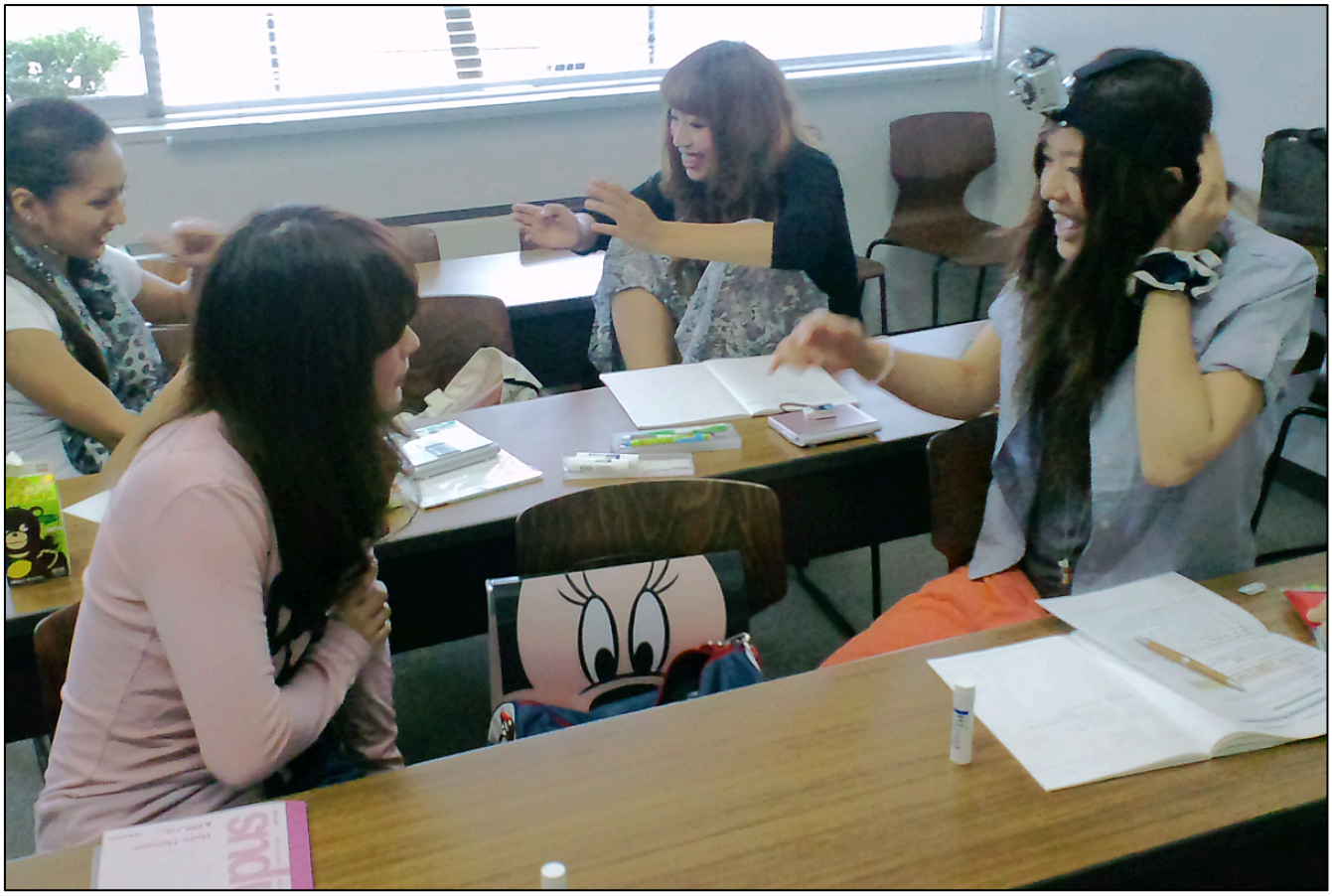
Screenshot 2: From an iPod Touch mounted on a HatCam

Picture 2: Seminar student wearing the iPod Touch on a HatCam

The HatCam, when paired with an iPod Touch or smartphone, has potential in making recordings from a number of points of view, should all students have a device. It might also be productive to have two wearers make recordings and compare various features of their conversation, focusing on forms, strategies use, nonverbal aspects, and the like.

4) GoPro HD Hero

The GoPro HD Hero camcorder captures excellent quality video and audio. It was the first POV-type, HD camcorder used in classroom trials (Kindt, 2010b, 2011). This was due, in large part, to the Hero's central, head-held position, what the author considers the ideal position among POV camcorders for capturing interaction in the classroom (Picture 3). It was used extensively in classes, contributing to the development of a variety of techniques and materials for classroom use. It is relatively expensive, and students have commented that it can cause fatigue when worn for an extended period of time. Also, to stay stable it requires a snug fit on the headband, which can become uncomfortable for some students.



Picture 3: An oral communication student wearing the GoPro Hero

In initial trials, the GoPro was effective for researching the teacher's instructional language (see Screenshot 3). Effectively recording the language of interaction between students, however, was limited without an external microphone for the wearer's partner.

Screenshot 3: Capturing teacher instruction with the GoPro Hero HD

In early applications of the GoPro camera, a single student sometimes wore the camera for an entire 90-minute period. This was done in an attempt to capture a particular student's experience for the whole period and to make it easier to keep track of who had worn the camera. This was made possible by the relatively long life of the GoPro lithium battery.
Because of its central position on the forehead and HD video capability, the GoPro is an excellent setup for capturing teacher talk or working in quiet rooms in small groups. It would benefit greatly from an external microphone, which will be included in the GoPro Hero 2 (US$299), available from December 2011.

5) Contour+
The Contour+ is another excellent quality HD camcorder. It is the first used in classroom trials with vastly improved sound quality from an external microphone (Picture 4, below). Easy to operate with a large on/off switch located on top of the unit (Figure 5, above), it does, however, lack an onboard viewfinder, which makes aim adjustment difficult. Like the Looxcie, the Contour+ has a viewfinder feature using Bluetooth and a smartphone, but it is difficult to pair and disconnects automatically when the recording button is pressed. In Contour+ trials on a tripod, made possible by rotating the camcorder's lens, the width of capture mitigated this problem (Screenshot 4).

Picture 4: An oral communication student wearing the Contour+ camcorder with an external mic

Screenshot 4: A view of a seminar class from the Contour+ on a tripod

The improvement in sound quality gave the Contour+ an advantage over other POV camcorders, but some problems with each microphone setup remained. In initial trials, the Sony ECM-AW3 (Figure 7, US$230) was used with a plugin splitter to allow for audio capture from both the wearer and the partner who wore the wireless microphone. The slightly cumbersome setup was eliminated in later attempts with the Sony WCS-999 (Figure 8, US$150), a wireless, radio microphone that allows for recording from both the wearer and partner transmitters. Unfortunately, the WCS-999 crackled somewhat when touched, requiring extra care from participants.

Figure 7: Sony ECM-AW3 wireless microphone

Figure 8: Sony WCS-999 wireless microphone

Though not able to record consistently clear audio, both wireless systems adequately captured both the voice of the wearer and partner (Screenshot 5). They were both useful for capturing footage from which 2 to 3 minute clips were edited and subsequently used as classroom materials. In this case in particular, the clips were used to provide near-peer role modeling of conversation strategies.

Screenshot 5: From the Contour+

Having experimented with POV camcorders since September 2010, a number of clips made from footage captured in oral communication classes have been returned to students. Though no in-depth survey has yet been conducted, initial response from participants' email and verbal comments hint at some positive effects. The first time clips are returned to students, they showed interest and some surprise. One reason for this may be that students in relatively reserved classes were seeing a highly engaged class for the first time.

The Contour+ has excellent, HD quality video. What sets it apart from other camcorders, however, is its connectivity with an external microphone. Some students have noted that it is a little heavy for extended wear, and, at times, they tilted their heads to one side or leaned on one hand. It could benefit from improved connectivity with a viewfinder, which the company notes is under development.

6) Drift HD

The Drift HD is another excellent, HD quality POV camcorder. It is the second generation of the Drift product, being the smallest currently on the market (December, 2011). It has a wide, 170˚ view and a convenient viewfinder, which is located the side of the camcorder, eliminating the need for a Bluetooth device to adjust the view (Figure 6, above). Like the Contour+, it also accepts an external microphone, is noticeably light, and in the opinion of the author, is the best current setup for capturing a participant view of classroom events.

The Drift HD was used extensively in trials in oral communication and seminar courses. Because of the lighter weight and accessible viewfinder, students were able to wear and aim it comfortably, and—even with wires to the wearer and partner's external microphones—change to other wearers easily. In some instances, the author also wore the camcorder, an area previously unexplored (Screenshot 6).

Screenshot 6: From the teacher wearing the Drift HD camcorder

Again, the Drift HD captures excellent POV footage, but being a side-mount unit, it will be challenged by the GoPro Hero 2, which also accepts an external microphone and has the advantage of being

centrally mounted. The Drift HD effectively captures verbal and nonverbal interaction, even in the noise of a typical language classroom. Drift, like Looxcie, is also exploring the potential of live streaming.

Potential applications

It may take only a few more years for POV technological developments to achieve the ideal in-class data collection set-up. Since the experience in and data gathered from language classrooms and other learning contexts differ greatly, recordings should provide naturalistic footage of student interactions. For exploring interaction, it would be preferable to have a video package that records an accurate participant point of view with quality, wireless video and audio but without a cumbersome setup. Perhaps it will be in the form of the i-Kam glasses with a quality, center-position camera and wireless capability such as a Bluetooth headset and microphones for both wearer and partner.

The pedagogical and research applications for POV camcorders are many. Similar to stationary and hand-held units, these are tools that can support classroom investigation from a number of perspectives. Considering pedagogical applications, for example, POV cameras could be used to research needs analysis, both initial and ongoing (Long, 2005), demonstrate or model particular interaction patterns (Oliver & Mackey, 2003), or explore the nature of student engagement in instructed language learning (Kindt, 2010a). Furthermore, materials made from transcripts from POV recordings could focus on student competencies (Savignon, 1983), particularly the use of communication strategies and negotiation between interlocutors during tasks (Lyster & Ranta, 1997). Derived from both exemplary and negative models (Hellerman & Cole, 2008), these recordings may be used to develop into materials that assist students in learning particular interactive skills.

Studies in curriculum design and evaluation could also benefit from POV-assisted research (Wette, 2009). Educators could explore individual differences in the classroom (Ehrman, Leaver, & Oxford, 2003), the impact of activities (Reinders, 2009), the effectiveness of materials (Spiller, 2005), motivational factors (Kikuchi, 2009), and the like. The majority of interactional strategies research, for instance, has been conducted in laboratory settings or based on teacher-student interactions during whole-class instruction (Valezy & Spada, 2006). Point of view recordings would allow researchers to explore interactional strategies—the nature of input, uptake, corrective feedback, and the like—not only in classroom settings but also between student interlocutors.

Besides using POV camcorders to capture footage from the participant point of view, educators could better understand participant perspectives in language courses by asking students to join them in viewing excerpts and offering explanations (Kindt, 2011). Already being used to explore behavioral and communicative dimensions in students with autism (Nikopoulos & Keenan, 2006) and artificial intelligence (Nehaniv & Dautenhahn, 2007), POV video analysis could be used to inform other teachers, shareholders, or future students.

In the area of teacher education, POV recordings could help promote teacher awareness (James, 2001), including teacher talk, behavior, comprehension, and the like. Specific areas of pedagogy could be explored, such as the effects of reactive scaffolding (van Es & Sherin, 2002). Edited clips could also be used to facilitate orientations for new instructors and assist in faculty development (Berardi & Gerschick, 2001). Researchers could consider using two or more POV camcorders simultaneously—one worn by a student and one by the teacher—to explore different points of view.

Like other tools used for pedagogical or research purposes in language classrooms, POV camcorders provide innovative functions that lead to new applications. The possibilities are dependent on the specifications and features of each camcorder and the objectives and interests of individual teachers and researchers. As with other innovations, new ideas build from experience gained in their application (Beck & Kosink, 2006). A number of potential applications have been described and suggested here, but individual educators will be able to explore their own innovative uses once the POV camcorder is added to their professional toolbox.

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