

Critical Autobiographical Research for Science Educators

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Abstract

In recent years the popularity of qualitative research in science education has increased dramatically. This is an evolving field in which new forms, such as critical autobiographical research, are emerging. This form of research focuses on the researcher's own life-history, involves writing in the narrative first person voice, and can give unique insights into the social and cultural forces shaping his/her own practice. Autobiographical research can be part of a multi-method participant-observation study, helping the researcher to deal with his/her own biases prior to interpreting and representing the perspectives of other participants. Autobiographical research also can form the whole inquiry, especially in cultural research, thereby enabling science educators to become cultural researchers and reveal hidden cultural forces influencing the social structures of schooling, the curriculum and their own pedagogies. Autobiographical writing, which is part of the inquiry process, commences with a descriptive account of key-issues and develops further into reflective thinking, generating new insights and heightening the researcher's sensitivities towards those issues, thereby enabling the researcher to see his/her research in the context of his/her biography and culture. An important goal of autobiographical writing is to develop pedagogical thoughtfulness. Another goal is moral; through the writing process we can come to understand how to make increasingly educative our interactions with others who share a commitment to educating the young. Not surprisingly, there are critical voices questioning the rigor and legitimacy of literature-based autobiographical writing. However, these concerns are largely unfounded because good autobiographical research attends to a set of quality standards. Critical autobiography as research is thus a powerful and legitimate means for making science classrooms more culturally relevant and more meaningful to students worldwide.

I started to enjoy being with my students. We developed a kind of solidarity. I started to be motivated in teaching and to see my students not as numbers sorted to fill in the lists of the classes. They were people, my students, with their language limitations, with their beliefs, with their curiosity about chemistry and their everyday life. In my classes, there were 200 people, after all, struggling to 'cross the border' between their everyday life and their chemistry classes. At that time I did not, in fact, recognize this border or the process of border crossing. Did I, as a teacher, cross the border smoothly or violently? On what side was I located if I was a native Mozambican teaching that strange knowledge grounded in a Western cultural view of the world? How did those two worlds define the kind of teaching I was doing? (Afonso, 2002, pp. 6-8)

Introduction

During the past twenty years, the popularity of qualitative research in science education has grown enormously. Qualitative research is an evolving field in which new forms, such as autobiographical research, are continuing to emerge. In case the reader of this article is unfamiliar with qualitative research, we discuss some of the major characteristics of this complex but exciting field while illustrating the potential of autobiographical research for science teachers and teacher educators.

Autobiographical research is concerned with studying one's own (auto) life-history (biography). As a form of self-study it is very supportive of practitioner research (i.e., action research) in which teachers engage in classroom based research for the purpose of improving their students' learning. It also can be one of the methods (i.e., a research tool) used in multi-method participant-observation studies of classrooms for enabling researchers to reflect critically on the impact of their (hidden) values on their research roles. Perhaps most interesting is the use of autobiographical research by cultural researchers for examining critically their own culturally situated teaching practices. Later in this article we illustrate how critical autobiographical research can be used for the latter two purposes.

Autobiographical researchers write in the narrative (first person) voice, as illustrated in the opening epigram drawn from a Mozambican science teacher educator's self-study. The knowledge of teaching and learning that emerges from this personalised form of research is of a practical nature (Connelly & Clandinin, 1988) and can yield unique insights into the practical wisdom of experienced science teachers. The impact of the research depends, however, on writing the research report in a way that deeply engages the reader. Here we consider the possibility of alternative literary forms and innovative quality standards for ensuring the integrity of autobiographical research.

When autobiographical research is conducted from a critical social perspective, it can enable teachers to develop critical reflective awareness of the culture of their profession, especially the shortcomings that restrain the quality of their educative relationships with their students. By understanding deeply how social and cultural forces have shaped our lives, we may come to view our established professional practices with a fresh and critical eye and, perhaps, feel more empowered to participate in reforms aimed at democratising the educational institutions in which we invest much of our lives and the lives of our children.

Consistent with the ethos of autobiographical research, we reveal something of our professional identities. Peter is a science teacher educator with over 20 years experience of conducting qualitative research and evaluation studies and supervising postgraduate students' qualitative inquiries (see <http://pctaylor.com> for details). He has practised autobiographical research (Taylor & Dawson, 1998) and his doctoral and master's degree students, who are usually science teachers and teacher educators, have made extensive use of it in their thesis research.

Elisabeth is a former research scientist (mineralogist), science teacher and communications facilitator who has recently completed a doctoral thesis on designing and implementing an 'ethics in science' curriculum for middle school. We provide a unique view into Elisabeth's personal experience of writing the autobiographical component of her thesis in which she reflected critically on the cultural origins of her

own moral beliefs and values and came to understand how they were unduly restraining the initial design of her thesis research.

Throughout this article, we illustrate various applications of autobiographical research with excerpts drawn from the work of Peter's doctoral and masters students.

Why Do It?

Just write. Even if it makes no sense, just write. Even if it makes you feel stupid, just write. Even if it makes you feel vulnerable, just write. Even if you feel the world is turning against you, just write. When you feel sleepy, just go to sleep and dream about that wonderful world you want to create. When you get up pick up your pen and continue writing. Because the truth is, when the mud settles down and the cloud clears away, everything becomes clear as day. In other words, you have written your world into existence because writing is both data and method. (Timothy, 1999, pp. 52-53)

Autobiographical writing produces narratives about our lives. But why, we may ask, is this worth the effort? Surely, some might say, this is nothing but self-indulgence or narcissism? Barone (2001b) suggests that narratives are designed to do what art does so well: to lay bare questions that have been hidden by the answers. Through autobiographical inquiry, we might start to question that which seems unquestionable to us, a given fact, something that 'has always been there'. We might begin to confront what the phenomenologists call our 'natural attitude', that is, our everyday way of thinking and valuing whose naturalness makes this process invisible to us; in much the way that the fish is unaware of the water in which it exists.

Mezirow (1991) explains that when self-reflection becomes critical it involves a searching view of unquestioningly accepted presuppositions. Most of what we have learned about ourselves has not been examined for unconsciously incorporated assumptions. However, this process might be of benefit to others. Instead of asking, "Why would anybody be interested in my unimportant life?", we might want to ask, "What experiences, issues, stories from my life can be of benefit for others? What is it, in what I say, that others might recognise in themselves? How can this affect my research and my attitude about who I am dealing with as a researcher and what I hear from the participants of my research? What can I learn from getting to know myself better?"

In these postmodern¹ times, dealing with one's own biases before interpreting and representing others has become an important issue of qualitative research ethics (Lincoln & Denzin, 2000). The 'crisis of representation' has taught us to look critically at our attempts to speak authentically about other people's experiences. Many researchers now accept that they are not disinterested but are deeply invested in their studies, personally and profoundly. As a form of self-study, critical autobiographical research involves a study of the researcher's self in relation to 'the other' (Bullough & Pinnegar, 2001).

¹ The core of postmodernism is the doubt that any method or theory, discourse or genre, has a universal and general claim as the "right" or privileged form of authoritative knowledge. Postmodernism suspects all truth claims of serving particular interests (Richardson, 2000).

A 'scholarly' writing genre?

The postpositivist² tradition of reporting science education research uses a scientific, objectivist 'scholarly' writing style. Barone reports on authors who (still) fret about the potential contamination through subjectivity of objective findings about the 'real world', a soiling to be minimised. According to Cronbach, the primary purpose of (postpositivist) social scientific research is to reduce uncertainty, to seek literal truth (Barone, 2001b). This tradition has been long-established in science education research and has made it difficult for alternative scholarly writing styles to be accepted in the science education research community (Stapleton & Taylor, 2003). Thus, resistance is to be expected from science educators whose natural attitude favours the modernist objective of striving for certain knowledge that transcends a fallible, human perspective.

By contrast, in their quest for understanding rather than explanation, postmodernist qualitative researchers usually practice an 'epistemology of ambiguity' (Pallas, 2001), that is, a way of knowing in which the goal is the enhancement of meaning rather than the reduction of uncertainty. Characteristically, their writing presents multiple voices, sometimes presenting conflicting perspectives; it would not be unusual for the conflicting perspectives to be voiced by one person, perhaps the researcher, perhaps another participant. For postmodern researchers, social reality is deemed to be contingent, complex and changeable; and thus to understand and represent this reality (as experienced by self and others) the qualitative researcher needs a rich repertoire of writing styles and skills. Autobiographical writing involves choosing from a variety of literary forms, such as fictive, impressionistic and confessional styles (van Maanen, 1988), undoubtedly a challenging task for many science educators accustomed to the traditional scientific style of research writing.

Critical Voices

And for all that concerns ornaments of speech, similitudes, treasury of eloquence, and such like emptiness, let it be utterly dismissed.

(Francis Bacon, 1620) (in Milne & Taylor, 1998, p. 37)

Not surprisingly, there are critical voices questioning the legitimacy of the literary-based autobiographical enterprise. Can autobiography ever be rigorous? How can we make sure that we do not indulge in solipsism and/or narcissism (Hargreaves, Earl, & Schmidt, 2002)? Does autobiography as a form of arts-based fictional writing not open the door to scientific dilettantism – research for the pleasure or benefit of the researcher only? Can autobiography ever be an acceptable form of thesis writing? In order to answer these questions it is necessary to illustrate that autobiographical writing can be scholarly if it attends to particular quality standards. The difficulty for qualitative researchers in answering these important questions is that there is no single best set of quality guidelines for 'validating' their research. Because qualitative research studies vary widely in their purposes, the short answer is that appropriate standards depend on the purpose of the particular study and the context in which the study is conducted.

² Postpositivism is characterised by 'critical realism' and a modified dualist/objectivist attitude. Although postpositivist researchers may use qualitative research methods, they tend to adhere to the cherished scientific standards of external and internal validity, reliability and objectivity, suggesting that their research findings are 'probably true' (Lincoln & Guba, 2000).

Quality Standards

A story's "validity" can be judged by whether it evokes in readers a feeling that the experience described is authentic and lifelike, believable and possible; the story's generalizability can be judged by whether it speaks to readers about their experience.

Whoops! I slipped again into speaking in a generalized, abstracted mode that provides no concrete examples of what I'm talking about.

(Ellis, 1997, p. 133)

Throughout the 1980s and '90s, qualitative science education researchers made extensive use of the anthropology-based ethnography standards of Frederick Erickson (1986; 1998) and the 'fourth generation evaluation' standards of Guba and Lincoln (1989; see also Lincoln & Guba, 2000). These 'constructivist' standards sit comfortably with the empirical traditions of most science education interpretive researchers interested in conducting inquiries into (other) teachers' practices. They provide standards for optimising the 'credibility' and 'plausibility' of data generation and analysis. The fourth generation standards support the researcher's role as a learner, require the use of the researcher's (first-person) voice in commenting on the analyses, and also serve to regulate 'authentic' (democratic) participation by key stakeholders in all aspects of the study.

During the past 9 years, since the publication of the highly influential [Handbook of Qualitative Research](#) (Denzin & Lincoln, 1994), interpretive researchers in science education have become increasing aware of critical social issues shaping both the learning environments they are studying and their own methods of inquiry and reporting. One of the critical issues pertains to the problem of how to understand and represent the inner world of the 'other', given that the process of interpretation is heavily infused with the worldview of the researcher. This 'crisis of representation' has given rise to calls for a strong self-study component in interpretive research and for alternative modes of representation (Denzin & Lincoln, 1994, 2000). Science educators are now responding in at least two ways: they are experimenting with literary forms of research writing and with self-study (autobiographical) forms of research. An important part of this experimental work is to legitimate new quality standards for regulating this research.

Following the pioneering work of Ken Tobin, who introduced fictive writing into science education research (Tobin, 2000), we have been making use of two [literary forms](#) of writing. Max van Manen's 'hermeneutic phenomenology' standards of writing allow the researcher to give strong voice to his/her pedagogical values (van Manen, 1990). Of special importance is the standard of adopting an educative standpoint in which the writer endeavours to engage the reader in 'pedagogical thoughtfulness', that is, to write in an engaging way that draws the reader into reflecting critically on his/her own pedagogical values. In writing stories that portray richly our own experiences in science classrooms, we draw also on John van Maanen's (1988) 'new ethnography' writing standards, which allow the writer to adopt confessional and impressionistic voices in order to express dramatically his/her thoughtful-emotional response to key issues in the inquiry, thereby engaging readers in a life-like story that appeals to their imagination (Geelan & Taylor, 2001; Taylor & Afonso, 2003; Taylor & Timothy, 2000).

Recently, we have found the work of two 'arts-based' educators - Thomas Barone and Eliot Eisner - to be helpful in extending our thinking about qualitative writing methods and standards. A (plain) narrative becomes an engaging arts-based text when the

language is expressive and creates a virtual reality in a pleasing aesthetic form, similar to a gripping novel. Importantly, the language shows a degree of ambiguity so that social reality is not explained via a single perspective; but the reader is invited to participate in bringing his/her own perspective to bear on the story, adding perhaps another distinctive set of meanings (Barone, 2001a; Barone & Eisner, 1997).

Turning to standards for self-study, and particularly autobiographical research writing, we hear Bullough and Pinnegar (2001) asking an important question: When does self-study ever become research? They explain that history and biography need to be joined, "...When the issue confronted by the self is shown to have relationship to and bearing on the context and ethos of a particular period of time, the self-study moves to research (p. 15)." In other words, we need to see certain events and our history in relation to each other and to the context – what was the influence of an event on the course of my biography? In order to answer the famous 'so what?' question about the significance of the work that 'wise' readers tend to ask, there must be a balance in evidence not only in what data have been generated and presented but in how they have been analysed, in how they have been brought together in conversation. Ultimately the aim of self-study research is moral, to gain understanding necessary to make increasingly educative the interaction between the researcher's self and others who share a commitment to the development and nurturance of the young.

Appealing self-study stories 'ring true' for readers and enable a personal 'connection' with the life-world of the writer (Bullough & Pinnegar, 2001). This brings in the literary standard of 'verisimilitude', or bearing resemblance to the truth (Adler & Adler, 1994). Further, good stories promote insight and interpretation. History is engaged forthrightly and the author takes an honest stand. A good self-study is a good read, and attends to 'nodal' moments (or specially selected critical events) of our biographies, thereby enabling the reader to gain insight or understanding into the self. Good self-study writing reveals a lively conscience and balanced sense of self-importance, tells a recognisable story, portrays character development, gives place to the dynamic struggle of living life whole, and offers new perspectives. The plot of a good self-study story is a series of events deliberately arranged so as to reveal their dramatic, thematic, and emotional significance. Similar to fiction, a good autobiography tries to reproduce the emotional impact of the author's experience in order to move the reader.

At this point we realise that we are in danger of repeating the same mistake as Carolyn Ellis in her multi-voiced account of the nature of 'evocative autoethnography' (see the epigram above), that is, to be speaking far too abstractly. So now we turn to some concrete exemplars of critical autobiographical research. As you read the following necessarily brief accounts perhaps you might return to this section and contemplate the issues we have raised here about quality standards or, better still, read some of the references that provide pathways into the exciting but complex field of postmodern qualitative research. Understanding the theory and practice of this form of research is necessarily an iterative process, and it has greatest meaning only when practised (as noted enthusiastically in the above epigram drawn from the critical autobiography of Joe Tambe Timothy, a science teacher and cultural researcher from Vanuatu).

Autobiography as a research tool

How It All Began?

My parents decided to move from Vienna to Braunau Am Inn, a small but beautiful mediaeval town of architectural splendour, only a few years before I was born. This decision presented me with the dubious pleasure of sharing my birthplace with Adolf Hitler, a fact that indeed was to be of some importance for my personal development later...The population of Braunau was split because a great number of people rejected the project [of erecting a monument for the victims of the Nazi regime], but not as might be presumed because they opposed the monument, as such, or because they thought that Nazism was such a great thing, but much rather out of fear that Braunau could become a pilgrimage site for Neo-Nazis or other war-tourists from all over the world...

Reading this story the reader might ask, "What is the reason that she is telling this story?" Some might think, "She comes from a guilt ridden society and now she is trying to take on the national guilt as her own". Others might say, "She is just trying to whitewash what cannot be whitewashed in order to make herself feel better." Perhaps a little of both these perspectives underpins my motives, yet the main purpose for telling this story of my home town and my upbringing is that, from an early age onwards, I have had a sensitivity towards ethical dilemmas. Autobiographical analysis has shown me that the idea of my thesis project topic goes back a long way to my childhood, a connection that had not been obvious to me before.

(Settelmaier, 2003, pp. 106-108)

Critical autobiography served as a tool to enable me to put my interpretive research study about (the value of) teaching ethics in science classrooms into the context of my own historical biography. This form of self-study is especially important because interpretive inquiry is not an objective, value-neutral process, but is shaped by the researcher's worldview. If interpretive inquiry is to be a truly educative experience then, from a critical social perspective, the interpretive researcher needs to be able to adopt the role of an authentic learner, and to become critically aware of how his/her own worldview shapes the design and conduct of the inquiry, especially the quality of his/her communicative relationships with other participants.

Authentic moral learning involves exploring and critiquing (hidden) cultural assumptions underpinning the ethical decisions that shape (distort) one's everyday communicative relationships with others. Evidence of a researcher's authentic learning indicates their trustworthiness to the reader of his/her research report (Guba & Lincoln, 1989). In this research I was advocating, via my 'ethics in science' curriculum, that students engage in authentic moral learning (involving critical self-reflection), and in the conclusion to the thesis I imply that science teachers wishing to implement an ethics in science curriculum may first need professional development that engages them in authentic moral learning. Thus it seemed to me that I was morally obliged to undergo a similar learning experience. If not then, as an outsider looking in on others' moral learning, my interpretation of their experiences would lack credibility (Guba & Lincoln, 1989). Furthermore, implications arising from my research would appear to be unfairly prescriptive if I was not able to consider them in the light of my own practice as a science teacher educator.

Laurel Richardson (2000) speaks of 'writing as inquiry' – this is how I experienced the act of writing an autobiography that stimulated my critical self-reflective thinking. The

writing process commenced with a descriptive account of key issues and developed further into reflective thinking, generating new insights and heightening my sensitivities toward those issues. Whilst writing, I found that there were different levels of depth. There is a 'top-layer' of self-knowledge, a layer we have constructed but might never have really questioned. And there are many more layers underneath that we may have completely forgotten about. I liken this process of writing to 'peeling an onion' where we pull away layer after layer, moving towards the core of our mostly unconscious biases. Critical autobiographical writing enabled me to reveal hidden biases that had influenced the way I was endeavouring to conduct my research. If not challenged, they would have severely restrained the way I generated and interpreted data on students' moral development. I realised how strongly my research-related decisions were grounded in my autobiography.

A similar point is made by Barone: "Our autobiographies as learners in childhood, adolescence, and young adulthood frame our approach to teaching at the start of our careers, and they frequently exert an influence that lasts a lifetime" (Barone, 2001a, p. 50). Given this life-long influence, and drawing on Parker Palmer's work (1998), we might want to ask the question, "Who is the self that does the research?" I use this and other questions asked by Palmer to summarise the learning outcomes of my critical autobiography:

What was my research about and how is the what of my research related to my autobiography? Autobiographical writing illustrated the close relationship between my biographical background and my interest in ethics, science, and the teaching of ethics within science education. It also revealed the relationship between the topics of the dilemma stories and my personal history. However, the self I described early in my autobiography continued to develop – it was not the same as it was at the beginning of the research.

Why did I perform the research? It became clear to me that my past experiences had raised my sensitivities towards ethical dilemmas: certain events and developments in my past had resulted in my conviction that controversial issues in and around science should be addressed in a critical manner in the science classroom. The emergent significance of the topic culminated in the curriculum development and ultimately in my research study.

How did I perform the research? Autobiography led to a much clearer understanding of how my sensitivities have affected and continue to affect my research. The writing process helped me to elucidate my culturally situated values and how they ultimately influenced the 'emergence' of the research design. Autobiographical inquiry allowed me to bring the resulting expanded awareness of the researcher's meaning perspective to the interpretive act, especially at the point of representing the other, thereby enabling an epistemology of ambiguity to shape the analysis. An example is the move away from my predisposition to making judgements about (i.e. measuring) students' moral development towards an interest in understanding (i.e. interpreting) their learning experiences. The researcher's self changed through all the insights gained during the research – as with the what, this would also have implications for the how – if I had the chance to 'do it all over again' how would I do it differently?

Who is the self doing the research? - Autobiographical writing (with a critical reflective intent) involved me in an exploration of my own interpretive horizons. Exploring my identity (Palmer, 1998) through critical reflective practice (Brookfield, 1995) led not only to enhanced awareness of my personal practical knowledge as a teacher and a

researcher (Connelly & Clandinin, 1988) but also led to a perspective transformation (Mezirow, 1991) – through this experience the research became a journey of personal development for me and potentially also for my audience.

My intention was not only to find out about the connections of my life history to my research but also to offer the reader opportunities of identification and perhaps disagreement.

Autobiography as Research

School is Useless!

One morning during a break, Joao, an assimilated 8 year old pupil, asked Julia, a non-assimilated girl, if she knew what olive oil was. Before she answered, he laughed, saying that he was sure that she did not know and had never eaten something prepared with olive oil. Some of my other school friends laughed, even though eventually it was clear that they too did not know what olive oil was. Other children were sympathetic and remained quiet. Julia was older than many of us in Year 2. She had failed twice and the teacher, originally from Portugal, had commented that she would never pass unless she improved her Portuguese, the language used in the school. Looking at Joao, Julia said, "I am not worried about that. I don't know what olive oil is, but I know how to prepare "mafurra" oil and I know how to cook a good peanut flour curry. My mum says it is very healthy. My mum says that when I grow up, I won't need all these schoolbooks in my life. I will only need to be able to go to the fountain to get water for my home. She says I will only need to know when to plant peanuts and vegetables, and to understand the language of the birds and the wind when they are telling us when will it rain and when the monkeys are nearby to steal my corn." I looked at her and I did know how to react, but I felt a little embarrassed. She continued "My mum said better understand the language of the birds than to understand Portuguese. My mum says school is useless; I am here just because she does not want trouble with the authorities. School is useless to my life!"

Joao ran to the teacher and told her about Julia. Julia was taken and the teacher hit her with a big wooden ruler-so that "she could think right."

(Afonso, 2002, p. 24)

Critical autobiographical research can enable science educators to become cultural researchers who explore their profession, revealing hidden cultural forces that, when left unchecked, can flow through the social structures of schooling, the curriculum and teachers' pedagogies, and lead to the reproduction of inequities and social injustices with long-lasting effects for the lives of children and society. This research process involves excavating one's personal life history, identifying eventful moments in time, representing them in story form, sharing the stories with colleagues and eliciting their commentaries, and finally writing one's own commentaries on the professional significance of the story writing.

At the beginning of this article there is an extract from an autobiographical story written by Emilia Afonso as part of her masters research project. Emilia is a chemistry teacher educator in Mozambique and her research was driven by her desire to find an answer to a question asked by one of her students: "Is there a Mozambican chemistry?" At the outset of the research Emilia already had a well developed critical awareness of cultural issues; having experienced as a child curriculum and pedagogical practices

resulting from centuries of European colonial rule, followed by an abrupt transition to an education system shaped by a Marxist-oriented government. As she commenced her research project she was intent on recovering and reasserting her earlier passion for making teaching more relevant to the everyday lives of her students: “Indeed I hope that this will be a contribution for we Mozambicans to develop a personality imbibed in our own cultural and social realities....” (Afonso, 2002, p. 12)

Emilia wrote a series of autobiographical stories, commencing with her primary school life (see extract above) and culminating in her appointment as a university lecturer, highlighting the structural barriers to creating a culture-sensitive science education relevant to all Mozambican lives. Whilst writing the stories she was also reading educational literature on science and culture, and was interpreting her life-stories through emergent theoretical referents. By the end of the project Emilia had developed a repertoire of powerful theoretical referents that enabled her to understand the initial research question in a more profound way. But more than this, she was able to reconcile the paradox of her professional life, which involved being able to understand and get involved with science but at the same time allowing her own cultural personality to govern her thoughts. She also had developed a powerful language for articulating her transformative role as a chemistry teacher educator, a language that enabled her, on returning home, to participate officially in the national discourse on science curriculum reform. Thus, for Emilia, autobiographical research engaged her as a cultural researcher and provided a rich professional development experience.

In Closing

The importance to science education of autobiographical research has been signalled recently by a special issue of the journal of the Australasian Science Education Research Association: Research in Science Education (Vol 29, Issue 1, 1999). There are exciting times ahead as qualitative researchers engage in self-study and experiment with a variety of literary forms. Autobiographical research promises to enrich the professional development of science teachers and teacher educators. In the hands of cultural researchers, critical autobiographical research is a powerful means of fuelling the political endeavour to make our science classrooms more culturally relevant and personally meaningful to students worldwide.

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