

Online learning predicates teamwork: Collaboration underscores student engagement

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Abstract

Much research into learning emphasises the scope of the learning experience and the nature of the learning environment. The issue of collaboration among learners is central to the concepts of learner engagement, authentic learning and cognitive load. While the impetus to deploy advanced technologies to support teaching and learning endeavours has not waned, it is increasingly evident that knowledge age learners must be appropriately supported to ensure that learning gains take place.

The application of the Zing Team Learning System (ZTLS) in face-to-face learning appreciably enhances the scope for collaboration and sets the stage for information sharing, co-creation of meaning, problem resolution, creative thinking and decision making. However, the procedural and process dynamics of ZTLS are inherently complex and powerful, and they require skilled facilitation. The key questions stemming from the use of the ZTLS for teaching and learning relate to: (i) social purposes or outcomes; (ii) effective management of the team/group's working rhythm or flow; and (iii) reconciling individual and collective desires to achieve particular educational outcomes.

Ongoing interdisciplinary research at Central Queensland University encompassing action research and activity theory addresses these issues, and reports initial developments that provide insight into the efficacy of the ZTLS as a knowledge creation tool. We argue that a shift in understanding the learning context is required in order to appreciate that the ZTLS clearly secures a working basis for distributed cognition. Moreover, ongoing research seeks to explore how teachers of adult learners can stress the importance of a 'knowledge-centric' andragogy as the basis for implementing higher education curricula.

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Introduction

The concept of collaboration in adult learning environments and the social consequences for learning and teaching are relatively well understood in adult educational circles (Laurillard, 1995; Wenger, 1998). In response to the challenge of engaging adult learners to use technologies and to collaborate as learners, we hypothesise that substantial gains in higher education teaching and learning are possible through the use of knowledge-based learning tools and processes. To date, the Zing Team Learning System (ZTLS) has demonstrated a number of social benefits, such as increased motivation and involvement, greater commitment to task and enhanced self-confidence which accrue through a combination of active learning (Felder & Brent, 1996, 2001) and technically supported collaboration or team learning (Callan & Whymark, 2002; Ward & Whymark, 2002; Waters & Callan, 2003). Despite the gains, we seek to illustrate how collaboration, through the use of the ZTLS (Findlay, 2000), enables adult learning in real time regardless of whether they are co-located or not. To this end, there are at least three main requirements that must be met:

1. the social purposes or learning outcomes;
2. the requirements for effective management of a team's working rhythm or flow; and
3. the constant need successfully appropriate individual and collective learner aspirations.

The ZTLS calls for facilitation skills familiar to specialists in nominal group techniques (Delbecq & Van de Ven, 1971; Delbecq, Van de Ven & Gustafson, 1975; Vedros, 1979), but offers teachers sufficient scope to engage learners in authentic learning. ZTLS encompasses methods such as problem based learning, the use of role play with case simulations and structured decision making, to name a few, through which gains based on constructivist learning methods (Wenger, 1998) are realised. Arguably the ZTLS, a type of Group Support System (GSS), is at least equal to, but more often exceeds, the capacity to add value compared with other learning technologies. As a teaching tool, the ZTLS generates opportunities for extended information management, and opportunities for knowledge creation and knowledge management (Purnell, Callan & Munnerley, 2003; Waters & Callan, 2003).

We contend that the development of a 'knowledge-centric' andragogy is pivotal in higher education, where an increasing emphasis is placed on offering more, but particularly to offering something distinctive to adult learners. Teaching and learning at this level is not only preoccupied with capturing the full gamut of human potential by emphasising learner interaction and interdependence through collaboration but also offers scope to use other media (Laurillard, 1995).

In an era where knowledge management is rapidly being acknowledged as a key distinguishing feature of education, and as offering social and economic advantages (Cibulka, Coursey, Nakayama, Price & Stewart, 2000; Fischer & Ostwald, 2001; Huysman, 2001; Mercer, 1995; Pfeffer & Sutton, 1999; Tiwana, 2001), there is no greater imperative than enabling teams of adult learners to interact, collaborate and secure learning through social engagement (Igonor, 2002; Stables, 2003; Stokes, 2001; Zhao & Campbell, 1996).

The ZTLS is a form of GSS technology that continues to address familiar constraints on group productivity in classroom settings. The experiences reported in this paper, despite the reputed gains brought to higher educational settings, are

part of outcomes associated with action research in Central Queensland primary schools (Callan & Whymark, 2002; Purnell, Callan & Munnerley, 2003; Ward & Whymark, 2002; Waters & Callan, 2003).

The technology comprises 12 keyboards interfaced to a single computer (PC or laptop) via a multiplexor (mux). The video signal from the computer is displayed via a single projector or a clustered array of visual display units (VDUs). Furthermore, the system is Internet capable, and will support the concurrent display of multimedia files, as well as electronic documentation, video playback and hyperlinks. In short, third party software can effectively be launched from within the ZTLS workspace, depending on the specification limits of the computer and its network interface.

Essentially, teachers facilitate a Zing Session by posing a series of open-ended or socially relevant questions. The questions stimulate an ongoing series of “Talk”, “Type”, “Read” and “Review” information handling and information sharing sequences. The keyed in responses and deliberations form a shared dialogue which supports cognitive activity within the team. The nature of this activity is identical to the Knowledge Management Life Cycle or Four Process View of Knowledge Management (Tiwana, 2001) illustrated in Figure 1. The application of the ZTLS also imposes a requirement for flow (Csikszentmihalyi, 1990; Csikszentmihalyi & Csikszentmihalyi, 1988), which is generally augmented by the facilitator who sets both focus and pace to an extent sufficient to keep the team ‘on its toes’. More specifically, the mode of teaching or facilitation ensures collective activity as ideas (contributions) are processed, sufficient to allow “distributed intelligence...and more complex formations of activity” (Pea, 1993, p. 67) to emerge. This is directly in line with the way in which knowledge and hence learning are socially appropriated—or more precisely “mutually appropriated” (Brown, Ash, Rutherford, Nakagawa, Gordon & Campione, 1993).

Figure 1: The four process view of knowledge management (adapted from Tiwana, 2001, p. 10)

Capturing	Organising	Refining	Transfer
Data entry Scanning Voice input Interviewing Brainstorming	Cataloguing Indexing Filtering Linking Codifying	Contextualising Collaborating Compacting Mining	Flow Sharing Alert Push

The ZTLS stands out as a type of GSS technology geared not only to exceed the conventions of group learning, as illustrated in Figure 2, but also to ensure that “human cognition aspires to efficiency in distributing intelligence across individuals, environment, external symbolic representations, tools, and artifacts as a means of coping with the complexity of activities we often call mental” (Pea, 1993, p. 81).

Figure 2: The ZTLS Team learning approach versus group learning conventions (Findlay, 2000)

Team Learning System	Conventional Group Learning
<ul style="list-style-type: none"> • Clear focus 	<ul style="list-style-type: none"> • Uncertainty of meeting purpose
<ul style="list-style-type: none"> • Everyone does the same kind of thinking at the same time 	<ul style="list-style-type: none"> • Confusion, talking at cross purposes
<ul style="list-style-type: none"> • Simultaneous input 	<ul style="list-style-type: none"> • Everyone takes turns at talking
<ul style="list-style-type: none"> • Clear thinking or decision process 	<ul style="list-style-type: none"> • No agenda or changing agenda
<ul style="list-style-type: none"> • Anyone can facilitate 	<ul style="list-style-type: none"> • Requires very good interpersonal skills to conduct a meeting
<ul style="list-style-type: none"> • Quiet people have their say 	<ul style="list-style-type: none"> • Some people dominate
<ul style="list-style-type: none"> • Closure through a focus on sense-making, deciding what projects to undertake, or preparing action plans 	<ul style="list-style-type: none"> • Lack of closure
<ul style="list-style-type: none"> • All have their say and feel their ideas have been considered 	<ul style="list-style-type: none"> • Some participants attempt to hijack the meeting to achieve their own goals
<ul style="list-style-type: none"> • Report is an exact record of all contributions and decisions available during or at the end of the session 	<ul style="list-style-type: none"> • Minutes often do not represent what was said at the meeting and may take days or weeks to produce
<ul style="list-style-type: none"> • Twice or five times faster than normal meetings 	<ul style="list-style-type: none"> • Take too long and take up too much time.
<ul style="list-style-type: none"> • Mostly win-win outcomes 	<ul style="list-style-type: none"> • Mostly win-lose outcomes
<ul style="list-style-type: none"> • Rapid team formation, cuts out forming and norming steps. Reaches the performing stage within one session 	<ul style="list-style-type: none"> • Low level of performance because the group fails to perform as a team
<ul style="list-style-type: none"> • All aspects of an issue are discussed 	<ul style="list-style-type: none"> • Rare that all issues are considered; jumping to conclusions dominates
<ul style="list-style-type: none"> • Fast, fun and enjoyable 	<ul style="list-style-type: none"> • Tedious, boring and to be avoided

An epistemology for knowledge creation

Cultural historical activity theory or CHAT (Decortis, Noirfalise & Saudelli, 2003; Halverson, 2001; Kipp, 1996; Verenikina & Gould, 1998) offers two very important considerations with respect to collaboration within adult learning environments. CHAT also signifies sufficient scope for distributive cognition and learning borne of social activity. The aphorism, “I Listen, I Forget; I See, I Believe; I Do, I Learn”, which more often than not is a motto widely espoused amongst primary school teachers, signals an enduring principle about learning being situated in activity regardless of the learner’s age or level of experience. In fact, learning as an activity is synonymous with socialisation in as much as learning through socialisation “...requires that human development be contextualised in the tool-environment of the community” (Rivera, Galarza, Entz & Tharp, 2002, p. 181). To this end, CHAT offers foundational theoretical insight into the “learner’s

interaction with materials and activity [that] occurs primarily in a social context of relationships” (Rivera, Galarza, Entz & Tharp, 2002, p. 183). CHAT derives from the work of Vygotsky, Leont’ev and Luria and holds as one central tenet a cogent view which sees that the:

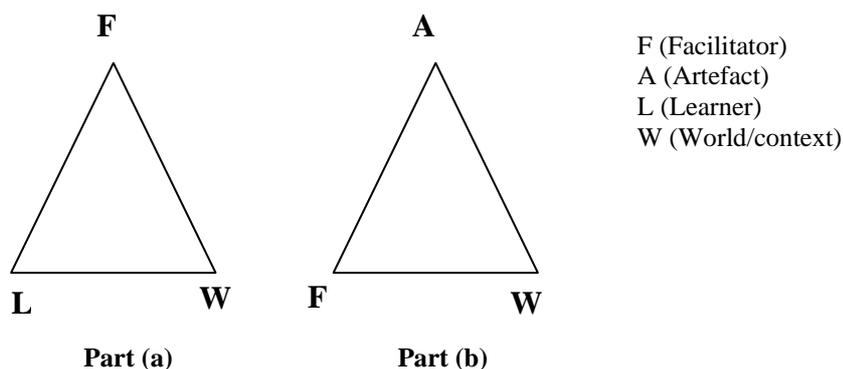
process of historical development of human behaviour and the process of biological evolution do not coincide; one is not a continuation of the other. Rather each of these processes is governed by its own laws. (Vygotsky, 1960, p. 71; cited in Salomon, 1993, p. 4)

In the light of the present effort to reflect on the application of the ZTLS in adult education, CHAT offers compelling theoretical insight into the design of classroom (or class spaces, when one considers current developments with online learning). Of particular importance is the capacity to conceive of such spaces for situated learning as being “composed of zones of proximal development...the region of activity that learners can navigate with aid from a supporting context, including but not limited to people” (Vygotsky, 1978; cited in Brown, Ash, Rutherford, Nakagawa, Gordon & Campione, 1993, p. 191). Inasmuch as CHAT provides the underpinning theoretical foundation, an explanation of the relationships between the learner and the ZTLS is required at this juncture.

The activity system model of learning

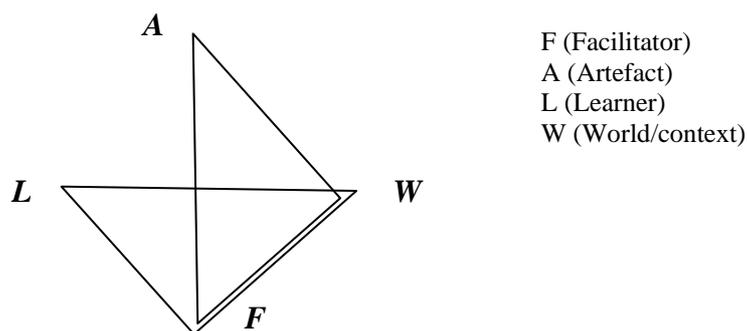
The first aspect is explained in Cole and Engestrom’s (1993) mediation triangle. The team of learners (L) attempt to gain knowledge of or to become skilled in the use of a concept or body of knowledge or artefact (A). In the case of adult learners, this could be programming skills, design skills in an object oriented programming environment or problem resolution through discussion. The learners are situated in a learning context or world (W), and all three elements interact constantly in the learning environment.

Figure 3: Coordinated systems of mediation (Cole & Engestrom, 1993)



The elements of Parts (a) and (b) in Figure 3 above illustrate the central role of the facilitator (or teacher) of learning (F), who mediates between the context or world (W) of the learners and the artefacts (A) which arise as a direct consequence of (mediated) learning activity. In Figure 4, it is possible to conceptualise the synthesis of the two systems of mediation, as one is overlaid upon the other.

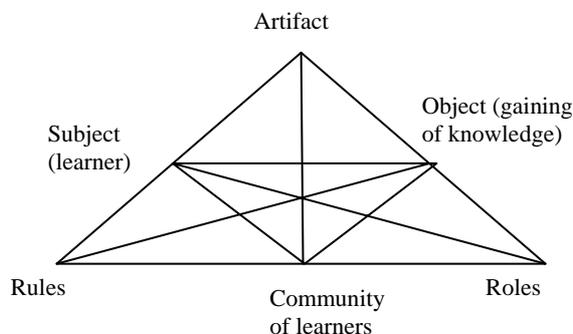
Figure 4: Combining the two systems of mediation



This leads to a final form of the model: the activity system view of learning in the context of a class space or environment. In this way, interaction occurs among a team of learners, the teacher (facilitator) and the rules for this form of knowledge creation. The subjects of the activity (the learners) all engage with relevant artefacts to achieve the object of the activity, which in this case is the appropriation of knowledge concepts or skills born of a structured and facilitated dialogue occasioned by the use of a tool such as the ZTLS.

This is a simplified view of the activity theory approach to understanding the learning context, which emphasises the place that collaboration holds within the realm of experience. A more comprehensive account of activity theory and its guiding principles is given in Verenikina and Hassan (1998), along with an explanation of the more detailed structure of the activity systems model, as illustrated in Figure 5.

Figure 5: Activity system model of learning (Cole & Engestrom, 1993, p. 26)



The zone of proximal development

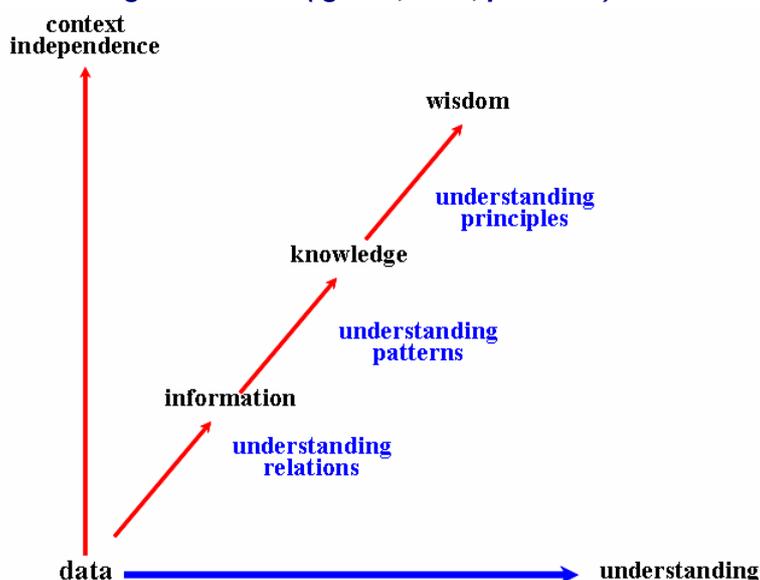
The zone of proximal development (ZPD) is more than adequately explained by Cheyne and Tarulli (1999), Wells (1999) and Brown, Ash, Rutherford, Nakagawa and Campione (2001), but the main point is that the ZPD is a theoretical abstraction of the limit to which a learner can develop with the assistance (intervention) of (skilled or competent) others, be they learning facilitators (teachers) or experienced peers. Learning development and achievement by means of social involvement with others are the underlying importance of this construct. The central metaphor of a scaffold is used to explain how interventions are conceptualised and operationalised during learning (Cheyne & Tarulli, 1999). The ZTLS exemplifies those elements that constitute the basis for such a scaffold and one can see the value of the playspaces that individuals use to key in responses to facilitator-led questions. Moreover, these elements are accentuated by the use of

specific sets of processes within the ZTLS to expedite team collaboration. Indeed, while the activity system can be thought of as describing the interactions that take place in a collaborative learning environment, the ZPD affords levels of abstraction that describes what is possible in particular learning contexts. Together, activity theory and the idea of a zone of proximal development provide the conceptual framework underpinning how learning and indeed knowledge are socially constructed and enhanced through collaboration within learning environments. In terms of considering distributed cognition in relation to the activity system, however, the lines of demarcation remain somewhat more provocative (Salomon, 1993; Salomon & Perkins, 1998).

The application of the ZTLS to adult learning

The ZTLS also lends itself to meeting requirements also for sharing expertise or skills as part of activity cycles in the provision of formal training. The example which follows illustrates the use of the ZTLS to scaffold a team's appreciation and upskilling with a software program used to analyse qualitative data. In this case, the questions used to facilitate the event exceeded the information elicitation types of questions highlighted in the first level of Neil Fleming's (1996) Knowledge Framework, as shown in Figure 6 below:

Figure 6: Knowledge framework (Igonor, 2002, p. 2 of 10)



This requirement to establish the relative position of each participant afforded the facilitator with much needed leeway in setting the stage not only for effective collaboration but also to negotiate a pathway to acquiring new knowledge, skills, attitudes and values (KASVal) (Whiteley, 1995). In short, training unlike learning involves other dimensions which must be scaffolded and appropriated according to requirements for managing change (Whiteley, 1995, pp 62–64).

In the first instance, introductory questions (in the form of an icebreaker) probed participant views of background experience and proficiency with qualitative methods, before establishing expectations and objectives for training:

1. Please provide a little history about your involvement with qualitative research methods.
2. Describe how you'd rate yourself as a user of qualitative research software tools (such as NUD.IST, NVIVO, ATLASi, Qualrus, Hyperqual or Ethnograph).
3. What exactly are you expecting to get out of today's session?

A second feature of the workshop, demonstrated in the way in which participants engaged with the learning content, illustrates the efficacy of working with teams and the ZTLS as a tool to secure activity cycles as part of the training methodology. The vehicle for introducing the team to ATLASi related to content associated with the game of croquet. The challenge for the team comprised using ATLASi to code exhibits of text, graphics and audio files to co-create a shared understanding of disparate elements of the game, its history and its merit as a recreational sport.

The team was instructed in the use of ATLASi under these conditions. The ZTLS was used to scaffold the training process in order to ensure that participants could share findings and co-create meaning, not merely about croquet but also about the features and skills required to use ATLASi to a moderate level of proficiency. The following excerpts from the workshop illustrate how rapidly the team generated a synthesised, yet shared, understanding of croquet as they acquired skills in the use of ATLASi:

Please identify the key elements of the game you've obtained from your reading and analysis of data about the game.

A sport	Real
Injuries can result	Backyard
Fun	The Ridgeway family has developed a new way to play with larger balls and wickets
A backyard game	
Injuries can be serious, sometimes requiring surgery	Can set personal goals to provide some stimulation in the game
Professional players	Requires a marketing strategy
The formal game is structured into set rules. Whilst the backyard game has many versions and is informal and fun. Both games still require skill. There is a nine wicket and a six wicket version of the game	The new game can be played with or without mallets. Played with mallets it is called <i>Mallet</i> ball. Played without mallets it is called <i>Toequet</i>
Revenue raising	Social involving a number of players
Can be fun, can be war	Players are aged from 5 to 105
Indiana is a big hole on the croquet map	Some breaks can be done in restricted places and can be amazing
humour about the game is important	Popularity depends on VIP patronage, eg, Charles II, President Hayes
Improper for men and women to compete together as it could lead to immoral conduct	Played in 30 mins in teams of nine (?) who take it in turn to belt a 7.5 cm ball with a stick through three gates before the other team
Dorrect technique can minimise injury	
Croquet started in England	Claims that young people can enjoy it—haven't seen evidence of this although was a game for romance in last century
Can be played at golf clubs	
Minimal space required	
Families enjoying playing "backyard" croquet but there are always problems with the rough ground	Toequet can be played on any field because the larger ball, usually a soccer ball is not stopped by rough ground or high grass
Social, competitive, skilful, a mysterious sextuplet that wins games, fun	

Exercises the mind as well as providing exercise	One version has a rule book while the other is informal
Croquet Association is 100 years old	Different variations exist
	Widely perceived as a sport for the hoity-toity rich
	If only its fun!

Evidence of the transition from information (understanding relations) through to knowledge acquisition (understanding patterns) illustrated in Fleming's (1996) framework (in Figure 6 above) is partly revealed in the flow of responses to a question that was put to participants at the conclusion of the workshop.

What new or crazy ideas could we create about the game?

It is fun!!!	Croquet has been around for over a hundred years and is becoming a sport for all
It is safe	
It stretches your limits	Some of its players are even over a hundred too
A new game is about to appear at your golf club	Croquet is no longer a sport for the rich
Play it anytime, anywhere	Croquet the extreme sport for octogenarians!!
You can play in your cocktail dress	
Getting a world ranking at any age is fun, but when you are past 40 its even more fun	

Conclusion

This exposition of the use of the ZTLS to extend adult learning beyond educational contexts to that of formal training is contingent upon ensuring that learning is situated in socially relevant activity. The advantages associated with the use of the ZTLS as a knowledge creation tool to scaffold instruction or training have been partially indicated here. Indeed, it is acknowledged that further research is needed to effect the juxtaposition of tools and techniques to ensure co-creation of meaning and distributed cognition under learning or training methodologies. In facilitating adult learners or trainees, there remains much to be done with respect to utilising the theories associated with the ZPD and enabling performance outcomes.

ZTLS is a tool that readily engages adult learners in collaborate with one another, while providing facilitators or teachers with sufficient scope to scaffold the structure of learning and training experiences in line with the four principles of adult learning practice. The data that can be extracted after a Zing session provide not only a useful record of a team's dialogue but also an insight into process observation and analysis. Today in higher education and adult education and training, the intellectual and social dimensions of curriculum implementation remain central to developing knowledge-centric approaches to learning. To this end, the ZTLS offers scope for mutual appropriation of the learning agenda between those vested with the responsibility for change facilitation and those who take up the challenge of learning within teams.

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