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Towards the Development of a Team Learning Theory for Information Systems: Implications for Universities, Academics, and Academic Developers

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Towards the Development of a Team Learning Theory for Information Systems: Implications for Universities, Academics, and Academic Developers

ABSTRACT

Contemporary universities are charged with the education and preparation of work ready graduates, evident in the establishment of graduate attributes. One attribute particularly applicable for information systems students, is the ability to work in teams. An examination of teamwork in the literature and in teaching practice indicates that many academics are unprepared or ill-equipped to prepare students for a world of work requiring team players. The unavailability of a comprehensive theory to drive the development of team learning in universities may have contributed to their failure to embrace this as a significant and warranted pedagogy. This paper explores a theory of team learning and pedagogy, critically appraises the enablement of students to acquire this attribute, and considers the research necessary to further shape the theory. Implications for curriculum and academic development are highlighted as these are the mechanisms to assist staff in applying the pedagogy.

Keywords (Required)

Team work, team learning theory, universities, academic development, information systems

INTRODUCTION

Three project management competence levels are described by Frame (1999), that of the organization, of the individual and of the team. While much emphasis has been given by universities to addressing both organizational competences and individual competences there has been less emphasis on the team competency factor.

Team learning will, according to Senge, (1992) be a critical step in building learning organizations stating that

> "Until we have some theory of what happens when teams learn (as opposed to individuals in teams learning) … Until there are reliable methods for building teams that can learn together, it's occurrence will remain a product of happenstance" (p238).

Within institutes of higher education, the incorporation of group work into pedagogies has become widespread, yet many examples have failed to embrace the potential benefits' of multiple contributor environments. For universities to advance the teaching of team learning and its inherent shared knowledge, a conceptual framework is required; one which will embrace the synergy and energy created when individuals aspire to excellence and are intrinsically motivated to accept challenge in dealing with conflict, in order to arrive at new knowledge. Yet the reality of team work performed in many universities is not meeting those high ideals as already noted by Jewels & Albon (2009).

A decade of cries of disgruntled students shouting 'freeloader' or 'lone wolf' (Barr, Dixon & Gassenheimer, 2005) when group assessment has been used to provide a grade to their individual academic record seems to have gone unnoticed or unchallenged within universities (Albon & Lindsay, 2005; Barr, Dixon & Gassenheimer, 2005; Pfaff & Huddleston, 2003). This is not to decry the efforts of some academics who have attempted to address student's concerns of fairness and justice by devising marking and assessment systems (Cheng & Warren, 2000; Zemke & Elger, 2005). But despite the efforts these approaches are fraught with implications if students are to truly acquire the graduate attribute of being able to work successfully in a team environment.

Not all learning in groups or group assessment appeals to all students, nor do such group or team practices guarantee students high grades. The laments of students indicate they think these practices are unfair claiming that the same mark given to all group members is unjust, with many preferring individual assessment tasks rather than be exposed to inequitable, or worse, unethical practices. Counter to the views of students are those of the workforce and by implication the role of universities in producing graduates for the unknown future workforce, who can work in a team. Senge (1992) noted over a decade ago the need for mastering team learning in organizations*: "Team learning is vital because teams, not individuals are the fundamental learning unit in modern organizations" (p10).* Leonard-Barton (2005) took a slightly different view to teams. "The

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complexity of problems in our knowledge society requires that problem solving activities be shared across disciplinary, cognitive, geographic and cultural boundaries". This implies that better and more innovative solutions may emerge when teams are used for solution generation and decisions.

Barnett (2004), who examined the future in education from a curriculum and pedagogical perspective, noted the need to go beyond content and consider humanness. And, although not explicit, he alludes to the ability to work in teams. "Neither knowledge nor skills, even high level knowledge and advanced technical skills, are sufficient to enable one to prosper in the contemporary world. Other forms of human being are required" (p253). Barnett believes students should graduate from universities as individuals to go forth with the confidence and willingness to speak up in a challenging world. Confident and successful students know their knowledge and skills may be contested and yet they know too that they " … have to launch themselves forth into a world that will furnish responses that cannot be entirely anticipated" (p253).

Experience of working in teams has the potential to prepare students for work with the unanticipated. In their extant review of the literature on teams Salas, Sims and Burke (2005) noted the words of others:

> "Teams have the potential to offer greater adaptability, productivity, and creativity than any one individual can offer (e.g., Gladstein, 1984;Hackman, 1987) and provide more complex, innovative, and comprehensive solutions to organizational problems (Sundstrom, DeMeuse, & Furrell, 1990)" (p. 556).

To explicate our intention and the importance of developing a team pedagogy we refer to the generic meaning of graduate attributes. Graduate attributes are defined as

> "qualities skills and understandings a university community agrees its students should develop during their time with the institution. These attributes include but go beyond, the disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses. They are qualities that also prepare graduates as agents for social good in an unknown future" (Bowden, Hart, King Trigwell & Watts, 2000).

As early as 2000, Scoufis (2000) noted the importance of contextualizing graduate attributes and that professional attributes are progressively developed over time and 'thus professional skills should permeate the whole curriculum rather than be isolated in a single or specialised course, avoiding the 'one-shot' or inoculation model of teaching" (Scoufis, 2000 citing De la Harpe, Wyber, Radloff and McKenna, 1999, p.3)".

It is not suggested in this paper that team pedagogy replace individual learning, rather, we suggest it should be included as a significant and integral aspect of university pedagogy. Despite fragmented efforts universities have been unable to develop curricula and pedagogy which will ensure graduates enter the workforce with this nominated attribute.

It seems that students have voiced their dissatisfaction in the only way they know how - groaning and complaining against group assignments. This signals the crux of the problem. In the absence of a theory on team learning academics have used group work utilizing collaboration as the essential feature and then substituted this as team work in the belief they are assisting students to acquire the attribute of teamness. The problem of multiple member assignment tasks is complex and this paper will firstly unpack the complexity. From this we interrogate a team learning theory emanating from the five components and three supporting coordinating mechanisms proposed for teamwork by Salas, Sims and Burke (2005).

COMPLEXITY OF THE PROBLEM:

1. Group and team work are not synonymous but are regarded by many academics as the same. Confusing these approaches stymies academics ability to clarify what they require their students to do, and creates stress for students who remain confused on how to achieve highly.
2. There is no team learning theory to guide academics' development of pedagogical practices using groups or teams. At best they design group assessments with an expectation that, by merely placing students in a group, they will metamorphose into a team player.
3. Collaborative and cooperative learning practices are fundamental to teamwork but insufficient on their own for successful teamwork. Designing assessment tasks requiring other and higher level competencies and processes without supporting students in their acquisition may set students up for failure.
4. Leadership is a skill requiring more than working behaviour of cooperation. Academics do not take seriously the role and conceptualization of leadership in either groups or teams and this creates added stress on students.
5. Allocating individual marks for individual contribution and effort in a group assessment task is one approach, but does not have a place in teamwork. Albon and Lindsay (2005) identified ten excuses why group is so detested or not

used and from this arrived at four key issues: Group work achieves different outcomes; group work requires different competencies; group work must be assessed differently and group work is underpinned by a different pedagogy. Group work, individual work and teamwork marking schemes are not automatically interchangeable.

6. All group work or team work requires a leader, but the role and responsibilities is rarely articulated between academic and student. Leadership in groups and teams is qualitatively different. The student intra-group leader may not have the skills or competencies to be a leader and often uses this role to be a controller and director but without consultation. This questions the leadership skill proficiency of academics and their knowledge of leadership, an issue for academic developers.

7. It seems the possibility of dual or co- leadership of the single group or teams may exist but has gone unrecognized. When an academic is the leader of several teams this concept has potential in a team learning theory but needs investigation.

8. Universities have identified that being able to work in a team is an important attribute students should acquire before graduating but have not provided academic development support to assist its teaching staff to write assessment tasks, to align assessment with learning outcomes and to research the acquisition of teamness during a student's life at university, nor how its effectiveness might be measured in the workforce.

9. The assessment of students in teams requires fundamental understanding of teams and their componential functioning. Both students and staff should be fully informed of the processes and functioning of teams. Curriculum and academic developers need to support staff in this endeavor. Students should not fail or receive low marks/grades due to the incompetence of academics in their use of groups or teams. Designing assessment which mitigates against potential achievement for individual students is unacceptable. Fairness and justice are essential to assessment practices.

In summary, the absence or sense of a team pedagogy is notable. Prior to a review and critique of team learning theory three concepts need emphasizing. Firstly, the primary goal of academics is for students to understand the principles and practices relevant to the subject or unit topic and be able to apply them in a new or novel context. A pedagogy must be critically selected which achieves this efficiently and economically. Second, academics' belief system that when students work in groups or teams they will miraculously learn teamness must be challenged. Third, an effective team needs an effective leader and somewhere within any one group or team academics expect a leader to emerge, never mind the quality or ability of these students who take on the leadership. This too must be challenged and resolved. Student's futures should not be compromised through poor teaching.

We believe a theory of team learning will identify the processes needed for successful learning in teams. We direct the next section of this paper to this end. Most of the literature on teamness is situated outside education, in organization theory within industry and with little practical application (Salas, et al. 2005, p.555). Therefore theories and practices related to industry, while providing the framework, will be interpreted into a formal university learning context. That is our objective. It seems logical that if the development of teamness and its incorporated competencies is seen as a pedagogy then academics, academic developers and researchers will have a theory, guidelines and practical exemplars to guide their own teaching practices.

Salas, Sims and Burke (2005) draw on the research from over a decade that has shown it is the team's processes that ensure team effectiveness and that implementing or creating a team of skilled members does not necessarily by itself ensure success. While much of the research has been examining factors influencing teamwork such as individual input, personality, team coordination, and leadership, Salas, et al (2005) have explored and elicited factors impinging on team effectiveness and team performance in a combinatorial way. Their Big Five in Teamwork with its three generic coordinating mechanisms to mesh the major five core dimensions of teams appears to offer some guidance and a framework to a theory on team learning and the teaching and learning of team competencies at universities.

The following issues/questions were inherent in our investigations of a theory of team learning:

*   The world requires and wants effective team performance in the workplace.
*   How can universities go beyond rhetoric (statements in graduate attributes) and contribute to the development of teamwork?
*   The task that teams are charged with affects the processes required for team performance (as cited by Salas, et al. p.563). Therefore, what are the processes the university seeks out for its graduates and can suitable tasks be designed by academics not 'trained' in team learning theory?
*   What should a team task typology look like in higher education?
*   Can and should all of the Big Five components and the supporting mechanisms be 'taught' at university?

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- How will the Big Five drive learning tasks and assessment tasks so that teamness is experienced and competencies developed?
- Can and should all five components plus the supporting mechanisms be included in the theory of team learning? Are all required or would less than five achieve the same outcome?
- Do different types of teams exist and if so do they manifest teamwork processes differently, and is there a type of teamwork activity/assessment (learning experience) that we should be developing at university for teaching information systems students in particular? Might the types of teams be less diverse in universities than the workforce? Or, do they differ across disciplines? Salas et al argue (p.563) for the necessity to focus on the actual tasks that teams perform to understand the processes that will lead to team effectiveness.
- Will the stability of the team and life span of the team while at university impact positively or negatively on the acquisition of desired team competency outcomes?

DEFINITIONS

The following definitions of team and teamwork are used for this paper.

Team: A team is two or more individuals with specified roles interacting adaptively, interdependently, and dynamically toward a common and valued goal (Dyer, 1984, cited in Salas, et al. 2005, p5.62).

Teamwork: Teamwork is a set of interrelated thoughts, actions, and feelings of each team member that are needed to function as a team and that combine to facilitate coordinated, adaptive performance and task objectives resulting in value-added outcomes. (Morgan, Glickman, Woodward, Blaiwes, & Salas, 1986 cited in Salas, et al. 2005, p562).

THE BIG FIVE IN TEAMWORK

This section will briefly explain the key features of the Big Five, followed by a critique relative to teams as a pedagogy in universities. The three coordinating mechanisms are introduced first followed by the five components.

Coordinating Mechanisms

Shared mental models (SMM) is defined as the "organizing knowledge structure of the relationships among the task the team is engaged in and how the team members will interact" (Salas, et al, 2005, p.561). In a university this means the relationships among the task as well as the relationship to the university grading system and policy. The completion of assessments on time avoiding late penalties, knowing the grading system and knowing the level/standard the team aspires to and differentiating between collusion and team work is part of the relationship to the university. Identifying the team goals within the assessment constraints, university and lecturer's expectations and each member's ability to achieve them will form part of the relationships of the task and the team member's parameters for interaction. Coming to terms with a team assessment is a process inherent in developing this coordinating mechanism.

Mutual trust defined as a "shared belief that team members will perform their roles and protect the interests of their teammates" (Salas, et al, 2005, p.561) is as relevant to universities as it is to industry. While not exclusive to the components of the Big Five theory, trust penetrates all members and their behaviours. Lencioni (2005) narrows this to vulnerability. He explains adults have a desire for self-preservation and that exposing oneself to risk for the good of others is unnatural and rarely rewarded. Vulnerability trust means providing opportunities for students to experience being comfortable with one another about weaknesses, failures, and fears. This is further articulated by Dahlback (2003) who explains how risk creates internal conflict. In addition, students need to have trust in the system –the university assessment system. They need to trust that assessment will be fair, that freeloading and lone wolves do not have a place in teamwork. They need to trust the leader of the team, which, as will be argued later, is the academic. Students and the team leader must first identify behaviours that must be shared, trusted, valued and accepted. It seems imperative that the expectations of the leader be shared in the team and a way forward made transparent. Team members must be willing to take risks – a perceived problem for university students. Students must trust each other in order to carry out 'mutual performance monitoring'. As noted by Lencioni, trust is the foundational building block to team functioning.

Processes to establish trust seem to overlap with other components of the Big Five model, but in universities considering the following list seems necessary to pave the way for openness, honesty and clarity, factors facilitating trust. In Toquam's model (Brannick, Salas & Prince, 1997) this was summarized as member, team, and task characteristics. The complete task should be analysed by the complete team in terms of:

i)   a time frame
ii)   each member's actions and intentions, skills and competencies
iii) how marks can be earned

iv)   the role/ behaviours / actions of each member to the completion of the project
v)   the process
vi)   times/achievements for celebration
vii) the process for mutual performance monitoring – i.e. reporting weekly on achievement of the allocated tasks.
viii) Reaffirm or amend goals and processes
ix)   Preparedness to communicate with team leader (the academic)

A university, in difference to the workplace and industry requires that a tangible product or outcome receive a grade. In the workplace the anticipated final product or outcome is the successful project result (albeit degrees of success) and anticipated continued employment (guaranteed salary). In universities the team is awarded a grade which is converted into a number and given to individuals to be recorded on transcripts. Student's perception of assessment of teamwork is that their individual ability is compromised. This student view signals an imperative to embed team assessment in a team learning theory making the process and grade transparent, unambiguous and with a valid and legitimate place in universities. The awarding of grades must be fair and just.

Closed-loop Communication is the exchange of information between a sender and a receiver irrespective of the medium. More important than the sender initiating a message is the receiver receiving the message, interpreting it and acknowledging its receipt. Added to this is the need for the sender to follow up to insure the intended message was received. A way of implementing and tracking this important series of behaviours should present itself in the design of team learning.
Flexible learning describes learners being at different places and communicating asynchronously. Meeting together at the university may not be the norm. Academics may assume all communication is adequate but closed-loop communication suggests this mechanism needs to be emphasized. The team may suggest a system be developed or supply an existing one.

Providing students with a list of possible responses that are diplomatic and respectful may assist in responding to messages of an unkind/unsupportive nature.

The Big Five Components

Team Leadership is defined as the "ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, develop team knowledge, skills and abilities, motivate team members, plan and organize, and establish a positive atmosphere" (Salas, et al, 2005).

We argue that it is the leadership of teams which sets apart a theory of team learning to a university context. Salas, et al. (2005) state that "team leaders ultimately facilitate team effectiveness not only by synchronizing and combining individual contributions of each of the team members but also by insuring individuals on the team understand their interdependence and the benefits of working together" (p.574). This may be relevant for leaders of teams in industry but it is not appropriate for leaders of teams of students who are completing assessments. The context dictates the leadership role be re-examined and reconsidered alongside the kind of tasks students may engage in, such as whether they are collaborative or coordinative. In a university team leaders must be the teaching academic of a unit or subject. This means the academic immediately becomes a leader to many teams who are all working to achieve the same outcomes. There can only be one leader in a team, and when it is the academic it brings an added dimension: this leader is not participating for the purpose of a grade or mark. Instead they are instrumental only in assisting students to obtain a grade or mark.

It is logical the 'academic leaders' play a role in the creation, maintenance and accuracy of shared mental models, mutual behavior monitoring and backup behaviour of each team. It is also crucial that academics model leadership behaviour to the individual subject participating students and each team. It may be possible for there to be a 'deputy' leader, a co-leader, pseudo leader or a team coordinator – one who follows up the leader's behaviours and intentions, but this is for future research. Salas, et al. (2005) cite Stewart and Manz (1995) who claim that " the team leader's failure to guide and structure team experiences to facilitate coordinative, adaptive action can be a key factor in ineffective team performance" (p.572). We concur the team leader will influence effectiveness through reinforcing performance expectations but the degree of performance monitoring and backup behaviour, the interaction of this leadership behaviour on students and the kind of task to be completed is yet to be explored.

Mutual Performance Monitoring (MPM) is defined as "the ability to keep track of fellow team member's work while carrying out their own … to ensure that everything is running as expected and … to ensure that they are following procedures correctly" (Salas, et al, 2005, 575). When teams are under stress an effective team will maintain awareness of team functioning by monitoring fellow members work in an effort to catch mistakes as soon as possible, behaviour a leader should be aware of.

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The debate on how groups are formed in educational settings for the sole purpose of enhancing learning is still out. At the university level group purpose is not centered on socialization but on cognitive action which will advance the performance of the team outcome. Nevertheless the two ways of forming a team within a university still apply; an academic selects students or allows students to form their own group with both influencing the ability of teams to engage in MPM. We are also aware that all students need to manage criticism, a major component of the treatment of gathered information, at least until MPM behaviour becomes the norm for any team work. Bayazit and Mannix (2003) identifies the absence of relationship conflict but the inclusion of task conflict contributed to decisions to remain in a team suggesting that students be forewarned of this effect on team functioning or, academics who know their students well, select the team members.

Teams function in universities usually for the duration of one semester leaving little time to establish mutual trust, let alone function in MPM. Selected membership and its inherent dynamics adds to the difficulties of doing MPM in a short space of time. As noted above, the method for selection and composition of teams is yet to be determined. Should guidelines be provided to direct students to where they could be the best team member? The research outcomes by Bradley, White and Mennecke, (2003) on the impact of the differences in interpersonal dynamics on short term teams and longer term teams, needs to be included in a theory.

Salas, Sims and Burke advocate two prerequisites to effective MPM: i) A shared understanding of the task and team responsibilities, and ii) the creation of an open, trusting and cohesive team climate. Students would need to learn that MPM is not intended as a means of keeping tabs on each other but is a means of confidently and positively examining all efforts and outcomes to achieve the team goals. This implies students need to learn these functions.

Before MPM can become an accepted norm of behaviour in student teams, universities need to consider its acquisition developmentally. Teamness is an attribute that must be experienced, and reflected upon over a number of years or semesters. We applaud the advantages MPM offers to teams to become more efficient and effective but are cognizant of the factors which militate against its use to improve learning in university contexts. If, as Salas, et al. (2005) propose, there is relationship between team effectiveness and mutual performance monitoring, specific behaviours in both team formations in a university need to be identified before observations and measurements can be made to conclude the input into a team learning theory applicable to universities.

Backup Behaviour is defined by Porter, Hollenbeck, Ilgen, West and Moon (cited in Salas, et al. p.579) as "the discretionary provision of resources and task-related effort to another…[when] there is recognition by potential backup providers that there is a workload distribution problem in their team". In a university context, the terms freeloader and lone wolf feature as these become ways some students address workload. Whereas Marks (cited in Salas, et al. 2005) proposes three ways to provide backup behaviour, such as coaching, direct assistance, and complete a task when an overload is detected, these are dependent on students acquiring effective MPM behaviours. We suggest that the team leader, include workload as part of their monitoring strategies, particularly in the early developmental phase of team learning. We also suggest research in to the relationship between lone wolf and freeloading behaviour be undertaken to identify if a relationship exists between these and personal conflict. If a student discloses they do not have the skills or competencies to complete a task, after the task is underway, something would appear to be wrong with the establishment of team orientation and SMM. However, if this emerges as an outcome of the direction the task is taking we recommend adoption of Marks' ways. We agree that flexibility become part of the shared mental model to be understood by all team members including the leader, but would also add negotiation of the task parameters with the leader. As reported by Salas, et al, backup behaviour affects team processes and attitudes. To know that team members provide support to each other if a problem of performance emerges manifests itself in trust (risk), cohesiveness and motivation.

The contribution of backup behaviour to a theory of team learning is not without concern. It may not ameliorate freeloaders or lone wolves in teams. Transparent processes, such as meeting documentation and agendas offer a formalized structure and specific behaviour which can be observed and measured. We concur with Porter that helping behaviour (request for assistance with a task) is different to backup behaviour further emphasizing the need to identify and quantify these in academic team tasks in order to establish this component in a theory and how it interacts with the other components. If, shared mental models and mutual performance monitoring are instantiated into a team learning theory will these supplant backup behaviour?

Adaptability is defined as "the ability to adjust strategies based on information gathered from the environment through the use of backup behaviour and reallocation of intra-team resources" (Salas, et al, p.560). Identifying cues that signal change or deviation and responding to these from within the team presupposes other behaviours linked to MPM. We are unsure of the extent that adaptability is required or needed in academic tasks and what the team processes may be. For example in 10-12 weeks how much maneuverability is there for a team to change or reassign subcomponents of the task? Reassigning tasks or

the order of completion may be acceptable but can adaptability in principle be incorporated into other components or mechanism? We would argue that while we recognize adaptability in principle, a clear design of the team task along with the other components of team orientation, mutual performance monitoring, and shared mental model, may be sufficient in a team learning theory. As with the other components, we recommend this behaviour be defined as it relates to university team leaning and assessment tasks and its discreteness determined before it is seen as a distinctive component of a theory.

Team orientation is defined as "the propensity to take other's behaviour into account during group interaction and the belief in the importance of team goals over individual member goals" (Salas, et al, 2005, p.561). This component shows attitude as members are willing to enhance another's performance while attending to their own task input. Team member satisfaction is related to team orientation because of the information sharing, strategizing, goal setting and increased task involvement. Members with a team orientation are more likely to have experienced greater gains and personal satisfaction from working in teams. Initiating, facilitating and managing a team orientation has been suggested through such processes as feedback about team successes and cooperation, accountability, focusing on expectations of workload sharing, communication, and creating a norm for cooperative behaviour through reward systems (Eby & Dobbins, 1997 as cited in Salas, et al, 2005). It has also been suggested that commitment to a team orientation facilitates the occurrence of other needed behaviours such as MPM and backup behavior.

Team orientation indicates that positive experiences in team work are needed in universities, a contrast to the cries of despair frequently heard. This gives further credence to the concepts of a developmental approach to team work and sound, credible and effective team learning design.

CONCLUSION

A discussion about students graduating in information systems with particular attributes introduced this paper facilitating the proposition of a team learning theory. The paper concludes by highlighting the issue of providing the processes and opportunities for students to attain the attributes of teamwork. Teamwork is proposed as a pedagogy which, when used appropriately should enhance student learning and is best promoted if underpinned by theory. The Big Five in Teamwork provided a framework in which to begin exploring the development of a theory. Although attention has been drawn to many research issues above only the most salient points are included in this conclusion.

A theory of team learning, while needing to be comprehensive, also needs to be simple enough to be adopted and used in universities by teaching staff, many of whom may not have an educational or academic designer background.

Two points have emerged as essential to the conceptualization of a theory of team learning. First, learning the skills and competencies to function effectively in a team is a developmental process. The Big Five Model has not attended to the changes which may occur due to the maturity of the team over time. However, we have recognized this to be essential to the conceptualization of a team learning theory in universities. This also has implications for academic developers, and the structure of the curriculum and its related assessment tasks.

Second, the design of affective and appropriate team task assessment seems to be a specialized and significant area. If universities are to heed the cries of students and are to respond positively and helpfully then they must surely consider the research required in this area so that academic developers can assist staff develop effective and appropriate team tasks. The way forward is to map exemplars of team assessment tasks onto this framework and continue to explore issues related to building a theory.

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