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Peer-tutoring: what's in it for the tutor?

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Drawing on role theory and socio-constructivist ideas about learning, this study explores how peer-tutoring can support tutors' learning. The sample comprised ten 16–17-year-old biology tutors, working with twenty-one 14–15-year-old students from a science class over eight weeks. Data were collected through an online wiki, tutor interviews, paired tutor discussions and video recordings. Tutors' perceptions of their role motivated them to learn the material, and their learning was supported by discussion and explanation, revisiting fundamentals, making links between conceptual areas, testing and clarifying their understanding, and reorganising and building ideas, rehearsing them, and working through them repeatedly, to secure their understanding. When tutors employed long answer questions, there was evidence of reflection on their learning and links made between conceptual areas. When preparing to tutor, tutors could focus on key points and engage with basic ideas from alternative perspectives. Mental rehearsal of peer-tutoring episodes helped them appreciate weaknesses in their own subject knowledge.

Keywords: peer-tutoring; tutor; peer learning; peer assessment

Introduction

Peer-tutoring is “the recruitment of one student to provide one-on-one instruction for another student, accompanied by explicit assignment of participants to ‘tutor’ and ‘tutee’ roles” (Roscoe and Chi 2007, 534). Peer-tutoring can facilitate tutees' learning (e.g. Allen and Feldman 1972; Annis 1983; Benware and Deci 1984; Topping 1996; Griffin and Griffin 1998; Robinson, Schofield, and Steers-Wentzell 2005; Ginsburg-Block, Rohrbach, and Fantuzzo 2006; Roscoe and Chi 2007). There is also limited evidence (Roscoe and Chi 2007) of benefits to tutors' learning (Allen and Feldman 1972; Goldschmid and Goldschmid 1976; Griffin and Griffin 1997, 1998; Robinson, Schofield, and Steers-Wentzell 2005; Ginsburg-Block, Rohrbach, and Fantuzzo 2006). In this study we examine how peer-tutoring supports tutors' learning from two perspectives: role theory and socio-constructivist ideas about learning.

Peer-tutoring and role theory

Tutors and tutees can have expectations about each other's roles (Falchikov 2001). A student in a tutor role may conform to tutees' expectations (Hogg and Vaughan 2005), and adopt their own perceived characteristics of the role (Bierman and Furman 1981). The role change involved may support their learning (Allen and Feldman 1972; Falchikov 2001).

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Forman and Cazden (1985) highlighted tutee questions as being important in role formation; the more a tutor is relied upon for information, the more “tutor-like” they become. Allen and Feldman (1972) and Goodlad and Hirst (1989) suggested that tutors undergo a restructuring and reorganising of the material to be taught because of enacting the tutor role. Tutees’ expectations of the tutor’s knowledge may motivate the tutor to learn and understand the material, enhancing their attention to detail (Topping 1996). Indeed, Allen and Feldman (1972, 13) suggest that improved test results derived from “the child exerting greater effort and working harder on the material while preparing the lesson”. Tutors may also be able to revisit simple concepts and the fundamentals that underpin a particular concept (Falchikov 2001), giving them a face-saving opportunity to legitimately revisit very basic ideas (Goodlad and Hirst 1989).

The tutor role may also increase tutors’ self-esteem because of the position of authority it provides (Allen and Feldman 1972). Deci (1975) suggests that tutors may become self-determining, by having a meaningful impact on their environment, facilitating their intrinsic motivation, although the pressure to master the material may in fact derive from not wanting to appear incompetent to tutees (Allen and Feldman 1972). That said, peer-tutoring may encourage positive attitudes towards school (Allen and Feldman 1972), helping tutors to understand the complexities of teaching, empathise with their teachers (Goodlad and Hirst 1989), appreciate how poor behaviour affects teaching and learning and understand the social and intellectual goals of education.

Peer-tutoring and learning

Thomas (1994) and Roscoe and Chi (2007) identified tutor–tutee discourse as important to both participants’ learning, providing tutees with increased attention, feedback and opportunity to discuss and challenge their learning. “Like-minded” discussion can allow tutor and tutee to “think in their own ways” (McCormick and Pressley 1997) as peers may have mutual interests, enabling discussion and use of relevant analogy, an appropriate level of detail and language (Roscoe and Chi 2007), and helping both participants to assimilate ideas more effectively (Goodlad and Hirst 1989). Indeed, when a tutor “scaffolds” tutees’ learning through discourse, their own learning may also be scaffolded (Topping 1996), particularly if the cognitive levels of tutor and tutee are closely matched. Webb (1982) suggests that tutor “explanations” can involve a “working through” of ideas, with the tutor’s thought process important to their developing understanding. She describes a “reorganisation and clarification” in the tutor’s mind, which can develop through elaboration and explanation. Tutoring may also allow the tutor to take a new perspective, or to see new relationships, facilitating improved understanding (Bargh and Schul 1980). King (2002) includes the use of modelling and analogy as an example of “higher cognition” that can arise in peer-tutoring situations. Building on this, Roscoe and Chi (2007) suggested that positive outcomes for tutors derive from explanations characterised by “reflective knowledge-building” (where tutors reflect upon tutees’ understanding and constructively build upon prior knowledge) rather than “knowledge telling” (where tutors simply lecture). They found school-age students prone to the latter style, and that tutor training encouraged knowledge-building strategies. Indeed, successful contingent instruction (when a tutor provides help when required and then “fades” the help to enable tutee autonomy (Wood and Wood 1996))

requires the tutor to use their own understanding to help scaffold the tutee's understanding.

Graesser and Person (1994) suggested that "normal" classroom conditions may act to reduce "active enquiry", and that students learn more in tutoring situations because they can ask questions pertaining to their own developing understanding; answering tutees' questions may itself scaffold tutors' learning. King (2002) indicates how tutor questioning in peer dyads can help support tutors' learning, with the roles of tutor and tutee quickly dissolving, and leading to an open discussion of equal benefit to both participants. However, such discussion must be well structured, involving teacher intervention in some cases, and must include thought-provoking questions which force students to think about the material, and integrate it with their prior knowledge, and construct new knowledge. Indeed, "deeper" questions designed to stimulate critical thinking may be effective in generating "knowledge-building explanations" in the subsequent discourse (Roscoe and Chi 2007).

As indicated above, initial training of tutors is important (Thomas 1994; King 2002; Roscoe and Chi 2007). Wood and Wood (1996) suggest that untrained tutors find contingent instruction difficult and give too much help. Rogoff (1990) notes that tutors often give shorter answers, and tend to concentrate on the "concrete", rather than explaining, or elaborating on conceptual connections. However, a well-coached tutor tends to give more "explanatory" responses in the same way that a "good" teacher can direct thought processes through the use of questioning and/or conversation. Indeed, Stenhoff and Lignugaris-Kraft (2007) found the most significant factor in positive tutee outcomes to be the time spent on initial tutor training.

Annis (1983) found that preparing to tutor also supported tutors' learning, over and above the effect of tutoring itself. Benware and Deci (1984) suggested that preparation to teach involves more "active learning", rather than the "passive learning" that occurs in response to extrinsic motivation such as testing. They compared a group who prepared to tutor a student, against a group who learnt the same information, but solely to pass a test. The former group scored higher on questions testing conceptual understanding but worse on questions testing rote learning; indeed, students expecting to tutor felt compelled to understand the text conceptually, rather than just rote-learn its content, and suggested that, in preparing to explain ideas to others, their understanding was "reorganised" a finding corroborated by Topping (1998).

Research questions

To examine how peer-tutoring can support the learning of the tutor, this study examines three questions: (1) How did tutors' role develop during the peer-tutoring programme?; (2) How did peer-tutoring support tutors' learning during peer-tutoring episodes?; and (3) How did peer-tutoring support tutors' learning when preparing to peer-tutor?

Methods

Sixteen students from a class of 16–17-year-old biology A-Level students at a North London Technology College volunteered to participate, with 10 students (seven girls and three boys) randomly chosen from this group. From a "mixed-ability" 14–15-year-old class of 31 students, 11 girls and 10 boys were given parental permission to be involved as tutees.

Peer-tutoring

Weekly tutoring sessions of 15–30 minutes were held after school. We provided some generic “discussion points” in case tutors were uncertain how to progress, but when planning their tutoring, tutors were encouraged to draw upon their training, which itself drew on guidance from Falchikov (2001) and Goodlad and Hirst (1989). To promote autonomy and commitment (as suggested by Roscoe and Chi [2007]), we gave tutors flexibility to prepare their own resources while providing structured guidance to help facilitate successful tutor–tutee dialogue. To help tutors recognise the strengths and limitations of different types of question (Webb 1982; King 2002; Stenhoff and Lignugaris-Kraft 2007), we encouraged them to construct questions which responded to the recommendations of Graesser and Person (1994): (1) tutors should listen to tutee responses carefully and base questions on them rather than what they perceive as tutees’ knowledge deficits; (2) tutors should avoid asking closed questions to test understanding (e.g. “do you understand?”) but focus on specific confirmation of content covered; and (3) tutors should ask specific focused questions. Graesser and Person (1994) suggested that tutors should be given examples of questions which engage tutees in long, developed answers that help to clarify their understanding. Examples of such questions were discussed and tutors advised to pre-prepare questions for each tutoring session. The generic question starters used in the reciprocal peer-tutoring scheme of King (2002) were adapted and given to tutors to assist them:

- How would you use ... to ...?
- What would happen if ...?
- What are the strengths and weaknesses of ...?
- How does ... tie in with what you have learnt before?
- Explain why ...?
- Explain how ...?
- What do you think causes ...?

Wood and Wood (1996) claim that untrained tutors find contingent instruction very difficult. Earlier work confirms this (Webb 1982; Rogoff 1990), categorising tutor explanations as involving either short, one-word answers, giving only “terminal” help; or longer, more thought-provoking “explanatory” responses. Tutors were given guidance in how to undertake the latter, including securing tutees’ attention, reducing degrees of freedom to keep tasks manageable, maintaining direction towards goals, marking critical features, controlling frustration and modelling solutions (De Guerrero and Villamil 2000).

Data collection and analysis

During the study, we used a wiki to “enable the team members to share knowledge simply and quickly” (Sauer et al. 2005, 82). Tutors responded to the following discussion points, and to each other’s responses, as the study continued: (1) discuss your start point when preparing to learn the information; (2) discuss how this would differ from how you would prepare for your own test; (3) discuss whether you might be worried about tutoring; (4) describe what you think the tutee’s perception of you might be; (5) what do you think makes a “good” tutor?; and (6) describe any “background voice” or running through of tutoring situations in your head. Other wiki questions focused on particular research questions as outlined below. Semi-structured

interviews and paired discussions were employed to examine wiki responses in more depth. Video recordings were made of these, and of tutoring sessions. Tutors were interviewed after completing three or more tutoring sessions to assess changes which took place during the programme.

How did tutors' role develop during the peer-tutoring programme?

We examined tutors' initial conceptions of their role via responses to the following wiki questions: (1) What was your main motivation to learn the information when preparing your tutoring session?; (2) What do you think are the behaviours and characteristics of the "teacher" role?; and (3) How do you think these roles apply when acting as a peer-tutor? Drawing on the literature (Allen and Feldman 1972; Benware and Deci 1984; Goodlad and Hirst 1989; Topping 1996), interviews and wiki responses were coded to identify and examine changes in role which took place as the peer-tutoring programme continued.

How did peer-tutoring support tutors' learning during peer-tutoring episodes?

Initial coding of tutoring-episode transcripts identified where terminal help was given and where explanatory assistance was provided. Occasions involving explanatory help were analysed further, based on the following distinctions: (1) when the tutor is confident in the material and can give a more elaborate explanation with ease; and (2) where the tutor must reorganise their existing (potentially lacking) knowledge in order to assist the tutee (Roscoe and Chi 2007). Tutor responses on scaffolding tutees' learning were also investigated via responses to wiki questions: (1) Can you outline the thought processes that you went through to make the tutee understand?; and (2) How do you think this process of explaining may have helped you to understand the issue better yourself? These questions provided a basis for semi-structured interviews. Following identification of long answer questions in the transcripts of tutoring episodes, tutors were interviewed to discuss how they devised questions, and the impact of such questioning on the tutors' own learning.

How did peer-tutoring support tutors' learning when preparing to peer-tutor?

Tutors' responses to the following wiki feedback questions were coded:

(1) What was your main motivation to learn the information when preparing your tutoring session? (2) How was the way in which you "looked" at the information to be taught different from the way you might have looked at it when preparing for a test? These questions, and outcomes from their analysis, were used to provide discussion prompts, as a basis for semi-structured interviews.

Analysis of findings

How did the tutors' role develop during the peer-tutoring programme?

Student tutors conform to their own (Bierman and Furman 1981) and others' (Hogg and Vaughan 2005) expectations of the tutor role. Open coding of wiki responses revealed tutors' initial perceptions of their role. These included setting an example, being easy to communicate with, and being an authority figure, a motivator, and a

friend. A majority of tutors could not “imagine a peer-tutor having the same authority as a teacher” (T2), and considered that tutors would not “give the same value to peers as teachers” (T3). Tutors’ main initial motivation for understanding the material was being competent: (1) in explaining for the benefit of others (35% of responses); (2) to avoid embarrassment (15%); (3) to gain a sense of achievement or adequacy (12%); and (4) to meet their own perceptions of the tutor role (4%), expectations which were broadly similar to those identified by Allen and Feldman (1972), Biddle (1986) and Gilliam, Callaway, and Wikoff (1994). When interviewed, there was evidence of role strain (Hogg and Vaughan 2005), with tutors initially concerned they would not live up to expectations, or be taken seriously by tutees:

They might not take me seriously ... they might just think well this is just a student so why should they be teaching me anyway. (T10)

Role strain arising from preconceived role expectations may fuel tutors’ motivation to learn, enhance their attention to detail and enhance the amount of time they spend understanding the ideas for themselves (Topping 1996). Indeed, many tutors were concerned about appearing to have sufficient subject knowledge, either generally or with respect to specific content:

Because if I don’t know the answer then first of all it would be embarrassing. (T5)

Because I don’t want to be embarrassed or not know the answer or something, I have put more effort into preparing ... I covered all the things that I would have asked about. (T10)

I went over the notes in advance, just reading about the topics and making sure my notes and stuff were right. (T4)

Like certain parts of the stuff on stars, I would find myself questioning something and then I would check it. So I would know if they asked. (T7)

After three tutoring sessions, role strain appeared to reduce as tutors embraced their roles, with their expectations and focus shifting from authority and subject knowledge, to generating discussion with their tutee on an equal level, a pattern also recognised by King (2002):

After the first session ... I realised ... she’s really interested in some of the physics so I just helped her with that and she had some questions for me, and I made some better questions for the second session. (T1)

Really we just worked on stuff like you do in lessons. I knew more about it I suppose, but it was just like, me helping them and talking ... I think [the first session] was too much like a lecture, the second time I just used questions. (T7)

Like [tutee] was really easy to talk to, and she asked some questions which made it easier for me too ... it gave me ... a focus for what to talk about, or look at. (T4)

This change in the tutors’ expectations is striking, and may be indicative of enhanced self-esteem (Allen and Feldman 1972; Goodlad and Hirst 1989; Falchikov 2001). Discourse may also have developed well because: “if both student and tutor have a similar age, the atmosphere becomes more relaxed, which in turn can open channels

of communication between them” (T1). Indeed, peers are likely to have mutual interests, which enable discussion and use of relevant analogy, level of detail and language, or avoid the cultural barriers that may exist between the teacher and the student (Slavin 1981; Goodlad and Hirst 1989; Roscoe and Chi 2007).

How did peer-tutoring support tutors' learning during peer-tutoring episodes?

Tutor explanations can operate at different levels, from confirming facts to longer explanations involving deeper thought, information processing, and the use of modelling and analogy (Webb 1982; Topping 1996; Roscoe and Chi 2007). Tutors' explanations were examined to determine whether they involved terminal help (acknowledging and confirming tutees' responses), “confident explanatory” help (recollection or consolidation of tutors' knowledge) or “lacking explanatory” help (reorganisation and clarification of tutors' understanding) (Webb 1982). From 112 explanations, the majority (58%) involved terminal help, mirroring a pattern found by Rogoff (1990). Twenty-four per cent involved confident explanatory help, but without obvious reorganisation of knowledge. Eighteen per cent of explanations were in the lacking explanatory category. Analysis of these suggested that tutoring near the upper limit of understanding is of greater benefit to tutors' learning. In this example, Tutor 1 attempts to explain how atomic structure was determined, and begins by discovering gaps in her understanding:

They fired it at some gold foil, basically they fired an electron or a proton at it, no hang on, they fired a gold atom at it. No, I'm sure it was a particle. (T1)

Subsequently, the process of explanation appears to test and clarify her understanding, helping her to reorganise (Topping 1992, 1998) and build ideas as she explains (Webb 1982; King 2002):

They fired a particle at gold foil, and what happened was, some particles, yeah, they *were* protons, went straight through [pause] yeah, some went straight through, and some bounced off at really large angles, and some literally like rebounded back ... So that basically told them that because that had a positive ... [pause] ... yeah, that's right, because that had a positive charge it totally repelled it, so that showed them that the nucleus was slightly positive, yeah? (T1)

After playing the episode back to the tutor, she admitted that after the explanation she understood better *why* the experiment helps understand atomic structure, and she went on to reinforce her understanding through use of analogy:

Yeah, like say the car can get straight through that means that there are no obstructions, no nothing, it's basically empty? (T1)

Tutors elaborated on their approach to tutoring. Most initially confirmed the need to “break it down and make it really simplistic so they can gain the basic picture” (T6), revisiting the fundamental concepts themselves. Tutees' responses also made tutors question their explanations, and reflect upon how to “reorganise” (Topping 1996) the ideas to help tutees understand:

I was thinking in my head, does that actually make sense ... I was asking myself did she get this or not? She looked confused. (T1)

What did I say to make them not understand that bit, or get this bit? Or what do I now need to say to make their expression change so they get it. (T7)

Likewise, tutees' responses helped tutors to recognise when they needed to correct their own understanding after tutoring:

I wasn't really sure about the explanations, but also I was thinking about the stuff I had prepared ... I did [check the stuff I wasn't sure about afterwards] actually, because I thought it might come up again, and also I just wanted to know. (T4)

Many of the tutors talked about repetition as being important to improved explanations and their own improved understanding, for instance:

I just had to like, go back over it in my mind and keep on repeating everything that I'm saying and making sure that it makes sense. Then by the end I think I got it, I got it just by like, going back over it all. (T1)

King (2002) also found that devising long answer questions may benefit tutors' learning, and the level of the tutor's questions may direct the length, and cognitive level, of the subsequent discourse. Literature suggests that student tutors find it hard to ask questions other than those focusing on factual recall or conformation of understanding (Graesser and Person 1994; King 2002). Examination of transcripts confirmed the majority of tutors' questions (102 of 138) were short answer, with many seeking confirmation of understanding ("Do you get me?", "Do you understand?"), or factual recall: "Since some of the information was important I made questions that gave me the answer" (T2). Average tutee response length to a short answer question was 3.8 words, and to a long answer question 11.1 words. However, just 36 of 138 questions were long answer. Rogoff (1990) recognised this pattern, with tutors focusing on "the concrete", rather than elaborating on conceptual connections. Even long answer questions devised by tutors yielded a maximum of two contributions from tutor and tutee. By contrast, discussions deriving from discussion prompts provided by us comprised an average of 3.2 contributions from both participants. Although this may suggest that tutor training was not extensive enough (Stenhoff and Lignugaris-Kraft 2007), there were signs that devising questions to scaffold tutees' learning prompted tutors to think about the ideas themselves (Webb 1982):

The short answer questions were easy [to devise] but the longer ones were a bit trickier. (T1)

Making up the short questions was very easy ... making the longer questions was a bit harder, as [you] had to think about the answers. (T2)

Indeed, some tutors reflected on their own knowledge-building process to ask questions (Roscoe and Chi 2007): "I wanted the student to think of the answer in the same way as I thought when [devising] the question" (T3). They also made links between topics, to help tutees make the links themselves (Bargh and Schul 1980): "They involved other topics as well as the topic that I was teaching" (T2).

How did preparing to tutor support tutors' learning?

Evidence suggests that preparing to tutor may benefit tutors' learning, over and above that of "normal" learning in lessons (Annis 1983; Benware and Deci 1984; Goodlad

and Hirst 1989; Topping 1998), and over and above tutoring itself. We asked tutors how they approached information when preparing to teach, as opposed to preparing for a test. Responses identified the opportunity to (1) focus on fundamentals, and to understand the material, rather than (2) simply rote-learning it:

I tried to simplify the topic, so that I could build on it; as if I was teaching someone who didn't know anything. (T10)

[Normal revision] would be more largely based on memorizing facts and regurgitating them. (T6)

Hence, preparation to teach may enable active learning (Benware and Deci 1984) and strategies based upon knowledge-building and transformation rather than just recall (Topping 1998; Roscoe and Chi 2007), something confirmed by examination of wiki transcripts. The following strategies were associated with "normal" revision, including memorisation of content, identification of key words, simplification and completion of past papers. By contrast, tutors reported that preparing to tutor involved diagrams, simplification of concepts, fun, interest, visualisation of ideas, identification of the main points, progression of ideas, building ideas from fundamentals and avoidance of confusing terms.

These descriptors were used to help support and structure interviews and paired discussions. Tutors recognised the need to seek out books to help focus on key points and essential information:

I looked in the GCSE revision book, like for stuff they need to know, and then I started to think about how I could change it and put it in a way that would be easy to remember. (T6)

I looked in my AS revision guide and notes, I have a CGP revision guide and just went through trying to take out the key points. (T9)

Using books at the tutees' level helped tutors reorganise the lesson material into a format more easily understood. This helped tutors to revisit more fundamental concepts; for example:

It reminded me of the stuff that we did in the beginning ... things I had forgotten. You know. The simple stuff. (T6)

I just looked at the simpler information and it helped me to understand some of the other stuff, like the stuff later on. (T5)

Engaging with the ideas from the tutee's perspective also appeared to inform the design and preparation of resources to be used during tutoring:

I think it helps to see the information in the way that they need to know it; it helped to make the questions. (T10)

In this case the tutor is referring to questions to discuss with tutees, and the need to interpret information in a different way to devise questions, a process which could lead to a "reorganisation" of their own understanding (Webb 1982; Topping 1998). Even "[writing] down explanations, like lesson objectives and stuff, going from one point to the next and so on" (T7) suggests that the tutor engaged with the ideas more

extensively than simply re-reading their notes. Evidence from other tutors corroborated this idea:

I just tried to manipulate it into a simpler form, so that it would be easier to know. (T6)

There was some stuff in there that I had forgotten, it explained it really well and I could use it to make summarising notes. (T10)

I made the simple cycle, and then put in the details, you know all the new stuff which we don't know and it builds up on that. (T4)

Hence, preparing to tutor appeared able to facilitate "transformation and reorganisation" of existing knowledge with the development of "new associations and integration" (Topping 1998), and triggering the kind of conceptual learning described by Benware and Deci (1984). Likewise, it may explain some of the outcomes of prior studies indicating a benefit to tutors' learning (Annis 1983; Benware and Deci 1984; Topping 1998).

Mental rehearsal or modelling of the tutoring session also appeared important to tutors' learning. In those cases where tutors modelled an "imagined discourse", the types of such discourse appeared to support tutors' learning. Some such discourse involved tutees asking questions, helping tutors to focus on developing their own subject knowledge:

I imagined them asking, what is this leguminous thing? And I would say, well these are the nodules and so on, and they would say, what are those? Or what do they do? (T5)

Like they would ask me questions about the stuff I was reading and I would check it, you know, like imagining the harder things that they could ask me. (T10)

I checked [the answers] as they came up just to make sure. (T4)

Other tutors rehearsed asking the tutees questions, looking at the information in combination with the key learning points for the topic, and then devising suitable questions to test the tutee, all of which suggest greater engagement with the material by the tutor:

I imagined bits where I could say, stick in a question about nitrogen in fertilizers, or bacteria. You know, like the bits they need to know. (T4)

Tutors also imagined how they would explain ideas in the following example, explaining how they would link the lesson content to something relevant to the tutee:

I definitely thought about the ways that I might go about explaining things ... to bring in natural stuff, maybe what's going on in that tree – so if you link it up with something that's happening in everyday life they might be more interested. (T4)

Some tutors' intention was to "help them get to the answer without just telling them" (T10), planning contingent instruction in a way which fosters tutors' engagement with the ideas at a sophisticated level, and high cognitive demand (Wood and Wood 1996):

I drew out the first four compounds for the alkanes and made them write out the formula for them. From the empirical formula they derived the general formula and did the same for the alkenes. (T7)

Conclusions and implications

Students' initial perceptions of a tutor's role developed from a preoccupation with being expert and authoritative; their motivation to learn the material being fuelled primarily by avoiding embarrassment, and being able to answer tutees' questions. As the peer-tutoring programme progressed, they became more facilitative of tutees' learning through discourse, potentially drawing on enhanced self-esteem, and benefiting from the chance to discuss ideas on an equal level with peers. Indeed, there was evidence that explaining helped to support tutors' learning through testing and clarifying their understanding, and reorganising and building ideas. Tutoring gave tutors the opportunity to revisit fundamental ideas and make links between conceptual areas. Likewise, it prompted tutors to rehearse ideas, working through them repeatedly to secure an appropriate level of understanding. Questioning also appeared to support tutor's learning. Although most questions were short, and did not elaborate on conceptual ideas, when tutors did use long answer questions, there was some evidence of reflection on their own learning and again links made between conceptual areas. Preparing to tutor also gave tutors the opportunity to focus on key points, and to present material in a format which required engagement with basic ideas and understanding of the tutee's perspective, forcing the tutor to actively engage with the lesson content. Likewise, there was evidence of tutors' working through and reorganising their understanding and using mental rehearsal of peer-tutoring episodes to help focus on gaps in their own subject knowledge.

This study examined one instance of peer-tutoring. It does not aim to make generalisations which apply across settings, but it may provide useful insights for other teachers working in similar contexts. Given a tutoring scheme takes time to implement, similar activities could be designed to engage students in the kinds of "active" learning highlighted above, without the logistical difficulties of actually running the peer-tutoring itself. However, students may need help to appreciate the value of such approaches to their developing understanding. There were signs that peer-tutoring enhanced tutors' metacognition, with many reflecting upon how to enable tutees' learning. This area may be a fruitful one for further research.

Notes on contributors

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References

- Allen, V.L., and R.S. Feldman. 1972. Learning through tutoring: Low-achieving children as tutors. *Journal of Experimental Education* 42: 1–5.
- Annis, L.F. 1983. The processes and effects of peer-tutoring. *Human Learning* 2: 39–47.
- Bargh, J.A., and Y. Schul. 1980. On the cognitive benefits of teaching. *Journal of Educational Psychology* 72: 593–604.
- Benware, C.A., and E.L. Deci. 1984. Quality of learning with an active versus passive motivational set. *American Educational Research Journal* 21, no. 4: 755–65.
- Biddle, B. 1986. Recent development in role theory. *Annual Review of Sociology* 12: 67–92.

- Bierman, K.L., and W. Furman. 1981. Effects of role and assignment rationale on attitudes formed during peer-tutoring. *Journal of Educational Psychology* 73, no. 1: 33–40.
- Bloom, B.S. 1956. *Taxonomy of educational objectives: The classification of educational goals. Handbook 1: Cognitive domain*. New York: McKay.
- Deci, E.L. 1975. *Intrinsic motivation*. New York: Plenum.
- De Guerrero, M.C.M., and O.S. Villamil. 2000. Activating the ZPD: Mutual scaffolding in L2 peer revision. *Modern Language Journal* 84, no. 1: 51–68.
- Falchikov, N. 2001. *Learning together, peer-tutoring in higher education*. New York: RoutledgeFalmer.
- Forman, E.A., and C.B. Cazden. 1985. *Culture, communication, and cognition: Vygotskian perspectives*. Cambridge: Cambridge University Press.
- Gilliam, A., S. Callaway, and K.H. Wikoff. 1994. The role of authority and the authority of roles in peer writing tutorials. *Journal of Teaching Writing* 12, no. 2: 161–98.
- Ginsburg-Block, M.D., C.A. Rohrback, and J.W. Fantuzzo. 2006. A meta-analytic review of social, self-concept, and behavioural outcomes of peer-assisted learning. *Journal of Educational Psychology* 98, no. 4: 732–49.
- Goldschmid, B., and M.L. Goldschmid. 1976. Peer teaching in higher education: A review. *Higher Education* 5: 9–33.
- Goodlad, S., and B. Hirst. 1989. *Peer-tutoring*. New York: Kogan Page.
- Graesser, A.C., and N.K. Person. 1994. Question asking during tutoring. *American Educational Research Journal* 31, no. 1: 104–37.
- Griffin, M.M., and B.W. Griffin. 1997. The effects of reciprocal peer-tutoring on graduate students' achievement, test anxiety, and academic self-efficacy. *Journal of Experimental Education* 65: 197–212.
- Griffin, M.M., and B.W. Griffin. 1998. An investigation of the effects of reciprocal peer-tutoring on achievement, self-efficacy, and test anxiety. *Contemporary Educational Psychology* 23: 298–391.
- Hogg, A.M., and G.M. Vaughan. 2005. *Social psychology*. 4th ed. New York: Prentice Hall.
- King, A. 2002. Structuring peer interaction to promote high-level cognitive processing. *Theory into Practice* 41, no. 1: 33–9.
- McCormick, C.B., and M. Pressley. 1997. *Educational psychology: Learning, instruction and assessment*. New York: Longman.
- Robinson, D.R., J.W. Schofield, and K.L. Steers-Wentzell. 2005. Peer and cross-age-tutoring in math: Outcomes and their design implications. *Educational Psychology Review* 17, no. 4: 327–62.
- Rogoff, B. 1990. *Apprenticeship in thinking: Cognitive development in social context*. New York: Oxford University Press.
- Roscoe, R.D., and M.T.H. Chi. 2007. Understanding tutor learning: Knowledge-building and knowledge-telling in peer-tutors' explanations and questions. *Review of Educational Research* 77, no. 4: 534–74.
- Sauer, I.M., D. Bialek, E. Efimova, R. Schwartlander, G. Pless, and P. Neuhaus. 2005. "Blogs" and "Wikis" are valuable software tools for communication within research groups. *Artificial Organs* 29, no. 1: 82–3.
- Slavin, R.E. 1981. Synthesis of research on cooperative learning. *Educational Leadership* 38, no. 8: 655–60.
- Stenhoff, D.M., and B. Lignugaris-Kraft. 2007. A review of the effects of peer-tutoring on students with mild disabilities in secondary settings. *Exceptional Children* 74, no. 1: 8–30.
- Thomas, A. 1994. Conversational learning. *Oxford Review of Education* 20, no. 1: 131–42.
- Topping, K.J. 1992. Cooperative learning and peer-tutoring: An overview. *Psychologist: Bulletin of the British Psychological Society* 5: 151–61.
- Topping, K.J. 1996. The effectiveness of peer-tutoring in further and higher education: A topology and review of the literature. *Higher Education* 32: 321–45.
- Topping, K.J. 1998. Peer assessment between students in colleges and universities. *Review of Educational Research* 68, no. 3: 249–76.
- Webb, N.M. 1982. Peer interaction and learning in co-operative small groups. *Journal of Educational Psychology* 5: 642–55.
- Wood, D., and H. Wood. 1996. Vygotsky, tutoring and learning. *Oxford Review of Education* 22, no. 1: 5–16.