

ONLINE ONE-TO-ONE TUTORING

Designing for effectiveness

1. TERMS OF REFERENCE

The Learner Support Business Unit requested a review of the available literature

- on the effectiveness of one-to-one tuition for learners in Key Stages 2 and 3 (7-14 years old), and
- how the online environment may influence this effectiveness.

In addition to fulfilling this request, this report offers a checklist of what represents good practice in one-to-one tuition in the offline and online environments for learners aged 7-14 years.

2. THE LEARNER SUPPORT BUSINESS UNIT

AQA set up the Learner Support Business Unit (LSBU) in 2009 to provide online one-to-one tuition to learners in Key Stages 2 and 3. It will launch with tuition in mathematics in June 2011, followed by English later the same year. Under the name MyTutor, the LSBU will provide a tutor-learner matching service and access to a learning platform, which will host online tuition sessions. The learning platform contains a shared whiteboard, audio and video facilities and the functionalities for viewing internet pages and sharing documents. It will be possible to conduct tutoring sessions in voice only mode (with visual aids) or with webcams so tutor and learner can see each other. BrightSpark Education offers a similar model of tuition using tutors based in India (Sellgren, 2010). The company offers no evidence of efficacy beyond testimonials from satisfied customers.

Online tuition makes one-to-one tutoring available to learners who are unable to access it due to a lack of tutors in their area, their remote location or because the cost of face-to-face tuition is prohibitive. Potentially, this model of tutoring may expand the market in tuition in the UK.

3. THE STRUCTURE OF EDUCATION IN THE UK

In the UK, learners are in primary education between the ages of 5 and 11 and then progress to secondary school. Primary education consists of two years of study at Key Stage 1 and four years at Key Stage 2. At the end of Key Stage 1 (6/7 years old), learners are assessed by their teachers and reports sent to their parents. Government-mandated national curriculum tests in English, mathematics and science are administered at the end of Key Stage 2 (10/11 years old) in addition to teacher assessments. The tests serve multiple purposes at these transition points in learners' educational careers.

- To show if a learner is working at, above or below the target level for their age.
- To help with decisions about streaming and provision of any additional learning support.
- As an indicator of the performance of primary schools.
- As a baseline for calculating the value added by secondary schools during Key Stages.

Academic achievement in the Key Stage assessments and tests is measured in Levels. Most learners are expected to achieve Level 2 and Level 4 in the core subjects by the end of Key

Stage 1 and Key Stage 2, respectively. The implication is that moving through two levels in a Key Stage indicates satisfactory academic progress.

The Department for Education sets targets for the percentages of learners achieving levels 2 and 4 each year. Responsibility for meeting these targets rests with schools and Local Education Authorities (LEAs). Learners' progression may be monitored by the use of sub-levels within the Key Stage Levels. If used, there are three sub-levels (low, medium and high), which are assigned through teacher assessments only.

From the age of 11 years, children attend secondary school. They start with three years in Key Stage 3 (11-14 years old) followed by two years in Key Stage 4 (14-16 years old). During this part of their education, they further develop their cognitive and social skills through classes in specific subjects. Based on the government's promotion of an English Baccalaureate, the core curriculum in Key Stage 4 is English, mathematics, the sciences, a foreign language and a humanity such as history or geography (Department for Education, 2010).

4. ONE-TO-ONE TUITION

In this review, one-to-one tuition is assumed to take place outside the hours of mainstream formal schooling and involves teaching carried out by one tutor, an adult, with one learner to supplement learning in the classroom. There are three measures of the effectiveness of tuition commonly in use: improvements in educational achievement; improved classroom behaviour, encompassing attitudes towards subject matter and levels of participation in class; and, increased confidence. Educational achievement is measured using either national tests (national curriculum tests in the UK) or standardised tests designed to assess aspects of literacy and numeracy. Measures of improvements in classroom behaviour include the completion of attitudinal questionnaires by learners and the recording by teachers of the frequency of participative behaviours in class. Reports of learners' levels of self-confidence are usually anecdotal in nature.

Since 2005 in the UK, three initiatives based on one-to-one tuition have been developed and evaluated:

- Every Child a Reader using the Reading Recovery programme (pg. 7, na, 2009a)
- Every Child Counts using the Numbers Count programme (na, 2009b; Williams, 2008)
- Making Good Progress pilot (PricewaterhouseCoopers LLP, 2009).

The purpose of all three initiatives was intervention. The aim of the intervention was to improve academic achievement in either or both English and mathematics by increasing the rate of progression of learners who were identified as failing to reach national benchmarks for their age. (The target population was the lowest performing 10%-20% of learners.)

The Every Child A Chance Trust (na, 2011) developed the first two initiatives in partnership with business, government and university education departments. Reading Recovery and Numbers Count are highly structured and intensive programmes of personalised tuition delivered by appropriately trained teaching staff to primary age learners. The target age was 5-6 years (year 2) for Reading Recovery and 7 years (years 2 and 3) for Numbers Count. Independent evaluations of the two programmes used standardised tests of literacy and numeracy administered before and after the intervention. Evaluations of Reading Recovery also compared learners who received the one-to-one tuition with control groups who did not receive the intervention. Learners in the Numbers Count programme completed an attitude survey

about their enjoyment of and perceived ability in mathematics, whilst their teachers responded to a survey about their observations of their students' attitudes and participation levels in class.

In contrast, the Making Good Progress pilot trialled five techniques, one of which was one-to-one tuition, to assess their effectiveness in raising educational achievement at Key Stages 2 and 3. Tutors, most of whom were either the learner's classroom teacher or connected to the same school, were not required to follow a particular programme of intervention. The pilot involved approximately 450 schools (373 of which catered for primary age learners). The evaluation of the pilot used teacher assessments at Key Stages 1 and 2 and compared the outcomes of Key Stage 2 national curriculum tests for learners who did and did not receive one-to-one tuition. The quantitative measures of achievement were supplemented by results from focus groups and in-depth interviews. Evaluation of the impact of one-to-one tuition on learners in Key Stage 3 was not carried out due to the lack of achievement data, national curriculum tests at this level having been discontinued (PricewaterhouseCoopers LLP, 2009).

4.1 Effectiveness of one-to-one tuition

The evaluations of all three initiatives found significant positive effects of one-to-one tuition on educational achievement.

- **Learning age increased to chronological age, on average, through intensive programmes of one-to-one tuition over 3 months.**
 - Reading Recovery learners increased their reading age by 21 months¹.
 - Numbers Count learners increased their number age by 13½ months².

- **Learners retained the positive effects of one-to-one tuition over the short-term.**
 - Reading Recovery learners maintained their chronological age in reading and a 12 month reading gap with learners who did not receive tuition (Hurry & Holliman, 2009).

- **Learners retained the positive effects of one-to-one tuition over the long-term.**
 - 72.3% of Numbers Count learners achieved level 2 in the Key Stage 1 teacher assessments. Prior to receiving tuition, none of them were expected to reach this level (Table 8, pg. 12, na, 2009c).
 - Reading Recovery learners outperformed non-Reading Recovery learners in the Key Stage 2 national curriculum tests by half a level for reading and a third of a level for writing (Hurry & Holliman, 2009).

The finding that the benefits of one-to-one tuition were retained was echoed to a lesser extent in the Making Good Progress pilot for English and mathematics (pp. 83-85, PricewaterhouseCoopers LLP, 2009). There are two possible reasons for the smaller effect. It may reflect the informal delivery of unstructured programmes of tuition in the pilot (Cohen, Kulik, & Kulik, 1982; Vadasy, Sanders, & Peyton, 2002) where tutors were not required to follow a specific tuition programme. Second, the intervention took place mainly with older students (9-10 year olds), for whom the effects of intervention tuition are not always as great as for younger students (Vadasy et al., 2002). School staff taking part in the pilot reported that a short burst of well-targeted one-to-one tuition brought a learner up to the ability level required for classroom work and allowed them to progress as independent learners alongside their peers.

¹ 3,259 6 year olds completed 41 hours of one-to-one tuition in 2007-2008 (pg. 14, na, 2008).

² 2,621 7 year olds completed 20 hours of one-to-one tuition in 2008-2009 (Table 4, pg. 8, na, 2009c)

“They don’t get stuck again. They have continued to progress. It has helped children get over stumbling block[s]. It also teaches them good learning behaviours.” School Pilot Leader in Making Good Progress pilot (PricewaterhouseCoopers LLP, 2009)

A good tutor is able to guide a learner in problem-solving, identifying errors and correcting those errors in a supportive and collaborative environment.

“Having someone who actually understood what was wrong, [the tutor] gave him lots of strategies ... it was really, basically, dismantling the English language, and teaching the English language – all the rules, and the strategies...” Parent (Ireson & Rushforth, 2005)

“... you know like in the class you daren’t say if you don’t understand whereas with the tutor she can actually say “no, I don’t understand”, and it’s like, right ok, we’ll do this again.” Parent (Ireson & Rushforth, 2005)

Some studies attempted to quantify affective and behavioural characteristics of learners before and after receiving tuition. Positive changes in attitude and classroom behaviour were observed.

- **One-to-one tuition led to improved attitudes towards a subject and improved classroom behaviour**
 - 91% of learners who received Numbers Count tuition showed improved attitudes towards mathematics, with the greatest improvement in teachers’ ratings of their behaviour and levels of participation in class (pg. 7, na, 2009c).

Gest and Gest (2005) observed a similar phenomenon in a small group of 5-7 year old children. Those who made the greatest gains in reading scores after tuition spent more time-on-task in the classroom. As a bonus, the increased amount of time-on-task was spent on behaviours that indicated engagement, such as writing or asking/answering questions.

Tuition helped to boost learners’ confidence by providing them with strategies to learn and problem-solve and the time to talk through their misunderstandings in a subject.

- **One-to-one tuition increased learners’ confidence**
 - Parents of year 6 students rated increased self-confidence (66%) as the main benefit of one-to-one tuition, above achieving the highest examination grades which was rated fifth (Ireson & Rushforth, 2005).
 - Year 6 students also reported greater confidence (60%) as the most important benefit of tuition, along with doing ‘better in school’ (Ireson & Rushforth, 2005).

There was a great deal of anecdotal evidence that one-to-one tuition improved learners’ confidence (Ireson & Rushforth, 2005; na, 2008, 2009c; PricewaterhouseCoopers LLP, 2009).

“The improvement in Jessica’s confidence is so marked. She used to be afraid to ask us anything about maths, but she came up with some questions about her maths homework last night.” Parent of learner receiving one-to-one tuition (Kirkman, 2010)

“Confidence really ... I don’t think she’s had that from school, particularly not from the maths.” Parent (Ireson & Rushforth, 2005)

4.2 Why is one-to-one tuition effective?

One-to-one tuition is effective for the following reasons (Bloom, 1984; Topping, 2000).

- A tutor is able to focus on the individual learner’s needs, which a teacher may not be able to do in the classroom.
- Tuition provides a supportive environment in which there is a higher disclosure of misunderstanding which can be corrected immediately.
- There are more opportunities for prompting of and self-correction by the learner.
- Tuition provides an increase in learning time which may be used for practice and engaging activities that expand on classroom work.

In their meta-analysis of 65 studies on one-to-one tuition received by learners aged 6-14 years, Elbaum and co-workers (2000) found two features of the type of tuition and two features of the curricular nature of the tuition consistently produced strong positive effects. Tuition that is based on structured programmes, such as Reading Recovery and Numbers Count, and of short duration resulted in improvements in educational achievement. In terms of curricular characteristics, tuition focused on mathematics, rather than reading, and lower level skills that were later assessed by tests also showed greater benefits.

The studies cited here are based on tuition for the purpose of intervention. As intervention tuition is usually funded by government, an evidence base is required to justify the use of tax payers’ monies. A consequence for this review is that it is limited to discussion of the effects of tuition on low-achieving learners. Where the information is available, it indicates that the samples of learners taking part in the studies and pilot contain higher proportions than in the general population of children whose first language is not English, who have a non-white ethnic background and are eligible for free school meals.

5. SOME PEDAGOGICAL CONSIDERATIONS

Pedagogically, primary education in the UK was influenced by the Plowden report (1967), which itself was influenced heavily by the work of Piaget who put forward the idea that the cognitive development of children took place in an unchanging and progressive sequence of stages (Alexander et al., 2009). The result was a commitment to teaching skills at the most appropriate points in a child’s development.

- *Pre-operational stage (2-6 years old)*: Children develop their language and social skills through play, but are unable to mentally manipulate information. Rather they need to manipulate and practice with real world objects. For example, in Numbers Count, learners count with real objects, such as tea cups and use puppets to which they explain their understanding of concepts learned. Learners in this stage are characterised by short attention spans and poor short term memories (Nir-Gal & Klein, 2004).
- *Concrete operational stage (7-11 years old)*: Children’s metacognitive abilities are developing and they are better able to handle representations and realistic simulations, although they still have difficulty understanding abstract concepts.

- *Formal operational stage (12+ years old)*: Children develop the ability to think about abstract concepts and logical thought, deductive reasoning and systematic planning begin to emerge.

Vygotsky developed Piaget's work and advocated challenging young learners to extend their development through learning. The challenge lay in Vygotsky's zone of proximal development. This describes the distance between a learner's current level of development, demonstrated by independent problem solving, and their potential level of development as determined by problem solving with scaffolding. Scaffolding is guidance provided by an adult or peers who are more capable than the learner currently is. It takes the form of constructing learning based on what has been learned previously. Construction is aided by asking questions that require learners to undertake comparisons and contrasts and consider time. Tutoring provides an ideal environment in which to offer scaffolding.

Crucially, both Vygotsky and Piaget acknowledged that cognitive development and learning take place through social interaction and that language skills are necessary for teaching and learning dialogues to take place. Without language skills, a learner is unlikely to develop their cognitive abilities and in particular their numeracy skills. This is the premise on which early intervention, using highly structured programmes such as Reading Recovery and Numbers Count, is based (Williams, 2008). Without intervention, the achievement gap continues to widen and many low achieving learners become disengaged from the learning process and, eventually, from the school environment (Vadasy et al., 2002; Williams, 2008).

6. MOVING ONE-TO-ONE TUITION ONLINE

There is a paucity of literature on the effects of online tuition on the academic achievement of school-age learners. Cavanaugh and co-workers. (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004) carried out a meta-analysis of 14 reports of the effectiveness of web-delivered programmes in improving academic achievement for the age range 8-17 years. This concluded that, for 8-17 year olds, there was no significant difference in academic achievement between students who participated in distance education through web-based learning programmes and those who were taught face-to-face.

A more recent meta-analysis (Means, Toyama, Murphy, Bakia, & Jones, 2009) included only five reports (out of a total of 46) of online learning programmes for 13-17 year olds made between 1996 and 2008. The authors concluded that for the wider age range (13-44 years), on average, online learning produced better outcomes for educational achievement than did face-to-face classroom-based programmes, although the effect was small. Means and co-workers went further in stating that there were greater benefits in terms of improvements in academic achievement compared with face-to-face learning when

- blended learning programmes (a combination of face-to-face and online learning) were used rather than purely online programmes;
- online learning was supplemental to face-to-face classroom learning rather than a replacement for it, resulting in greater time-on-task; and,
- the learners were older, though there was still a positive, but not statistically significant effect for 13-17 year olds³.

³ Undergraduates: mean effect size = +0.35, $p < 0.001$, graduate students and professionals: mean effect size = +0.17, $p < 0.05$

The same researchers concluded from a further narrative review of quasi-experimental studies that online learning environments were of benefit to students when they provided

- learners with some control over their online learning environment;
- opportunities for learners to reflect on their learning; and,
- sufficient multimedia, but no more, as research appears to support a 'less is more' approach to the incorporation of media in learning.

Extrapolating from these conclusions, it is possible to argue that older learners (13+ years) are likely to benefit from online one-to-one tuition when it is additional to classroom learning and increases learning time. However, it should not be assumed that using online tuition as a supplement to face-to-face classroom teaching for younger learners is likely to be successful. In their review, Cavanaugh et al (2004) discussed reports from the Alberta Online Consortium showing virtual school students' scores in mathematics at ages 8 and 11 years and in sciences at age 11 years lagged significantly behind the scores of students in conventional schools. It is possible to speculate that these children lacked the social interaction between their peers and adults and guidance from more competent others that Piaget and Vygotsky advocated. Without these activities they did not develop sufficiently the linguistic and social skills that would allow them to learn.

Young learners need adults to mediate their interactions with computers. Nir-Gal and Klein (2004) studied 150 5-6 year olds who used an integrated learning system with three levels of teacher mediation: full, partial and none. Those learners in the full mediation group significantly outperformed learners who had worked with less or no adult mediation on standard tests of abstract reasoning, vocabulary, visuo-motor coordination and planning behaviour. In the UK, integrated learning systems designed to manage learning through computers did not improve achievement on external examinations taken some time after the learners had used the systems. In the words of Fitz-Gibbon (2000) "computers are not great teachers".

Therefore, great caution is urged in the provision of online tuition to learners at the start of Key Stage 2 and learners diagnosed with learning difficulties in literacy and numeracy. In Piaget's pre-operational stage, these learners are lacking in the skills of autonomous learning such as self-regulation and self-explanation (Musgrove & Musgrove, 2004). To develop, they require interaction with real world objects, including other people. The provision of tuition in the non-real online environment has the potential to exacerbate any latent or actual learning and socialisation difficulties. There is a strong argument for maintaining an offering of face-to-face tuition for these learners. In real world situations, tutors are more able to direct the focus of learners and there are fewer distractions. Older learners, towards the end of Key Stage 2 and in Key Stage 3, should be developing their metacognitive abilities, self-regulation and their ability to use symbols and representations of real-world objects. With this toolkit they are likely to be able to benefit from online tuition.

7. GOOD PRACTICE IN EFFECTIVE ONLINE ONE-TO-ONE TUITION

Drawing on the evidence of witnesses to pedagogical practices in the UK, the Cambridge Primary Review (Alexander et al., 2009) set out five core principles for teaching that is dialogic (learner and teacher constructing meaning and understanding through talk) and based upon the work of both Piaget and Vygotsky amongst others. Here, the descriptions of the principles are adapted for the one-to-one tuition situation.

- *Purposeful*: a tutor plans and steers the learning dialogue with specific educational goals in view.

- *Collective*: tutor and learner address learning tasks together.
- *Reciprocal*: tutor and learner listen to each other.
- *Supportive*: the learner articulates their ideas freely, without fear of embarrassment.
- *Cumulative*: tutor and learner build on their own and each others' ideas and chain them into coherent lines of thinking and enquiry.

Evidence (Cohen et al., 1982; Topping, 2000; Vadasy, Jenkins, Antil, Wayne, & O'Connor, 1997) indicates that one-to-one tuition is effective because it puts into practice these five principles. However, transfer to the online environment requires that additional factors be taken into account. These are included in the following guide to good practice, but in essence refer to the training of tutors in online communications and streamlining the visual impact of the online environment by using age-appropriate language, intuitive controls and adopting a 'less is more' approach to multimedia applications.

- ***Purposeful***

An assessment of the learner's needs provides the purpose of the tuition. Diagnostic tests can provide this assessment as can communications with parents and teachers. There should then follow a negotiation on the type and duration of tuition required. Younger learners (6/7+ years old) will benefit from highly structured programmes of tuition and shorter tuition sessions (30 minutes). All learners, regardless of age, should be provided with a tuition plan so that learning objectives can be measured against achievements. Tutors who are trained teachers are best placed to do this. Research does not indicate there is an advantage in terms of learning outcomes when the tutor is known to the learner prior to tuition. Tutors need to be skilled in online communications and the use of software applications.

- ***Collective***

The tutor should ask open-ended questions to assess the learner's ability level and understanding of material; pause to allow the learner thinking time, offer prompts when necessary and provide scaffolding to enable the learner to explore their own understanding of topics. The tuition materials should assist the tutor by offering variety combined with simplicity and extensive opportunities for reinforcement. The learning platform should facilitate the collective nature of learning by using clear, consistent navigation and being intuitive rather than relying on written instructions.

- ***Reciprocal***

The tutor needs to identify the learner's misunderstandings and mistakes and be able to correct them with immediate feedback. The learner should be encouraged with specific praise and given the confidence to attempt problems with varying amounts of scaffolding. To facilitate this two-way communication, online tuition materials and the learning platform should provide learners with opportunities to interact with the materials (Means et al., 2009) whilst requiring the least amount of instruction in their use from the tutor. For younger learners, the vocabulary should be developmentally appropriate.

- ***Supportive***

The tutor is responsible for establishing a trusting relationship with the learner by using praise for good performance, providing reliable learning strategies, and promoting self-correction in the learner. The tuition environment should extend beyond the learning platform to include liaison with a learner's parents and teacher(s). The tutor may need to coach parents in the provision of a suitable learning location that is quiet, well lit and with learning resources close by. Parents may also need to be coached in how to maintain the benefits of tuition with guidance on reading and completing homework with their child.

- **Cumulative**

The tutor should regularly summarize and review the work that the learner has completed and their achievements during a session and a tuition programme so that the learner can see progress and build on their previous learning. Consistent and regular tuition times will facilitate this. The learning platform should provide the functionality for record keeping.

8. CONCLUSIONS

A review of the literature on one-to-one tuition focused on those reports that attempted to compare measures of academic achievement and affect for learners aged 7-14 years old who received tuition and those who did not. Few such reports were found and the review was extended to older age groups. In general, one-to-one tuition as a supplement to face-to-face classroom learning is capable of

- Improving levels of academic achievement by increasing learning age to chronological age and improving performance on national curriculum tests through intensive programmes in reading and mathematics.
- Maintaining its educational benefits in the short and long term because it offers the opportunity to correct learners' misunderstandings and to provide them with problem-solving strategies.
- Improving learners' attitudes and behaviour in the classroom as students who are able to tackle classroom work are engaged and spend more time-on-task.
- Increasing learners' self-confidence as they become more adept at expressing themselves and spotting and correcting their own mistakes.

One-to-one tuition is most effective when it is delivered as part of a structured programme and over short durations. Sessions should be no more than 30 minutes for younger learners within a programme lasting approximately three months. Online tuition is best offered as a supplement to, not a substitute for, classroom learning. For maximum benefit to the learner, the following aspects of online tuition should be addressed.

- Training tutors in online communication skills and software applications so that the tutoring time spent on subject-specific content is optimised.
- Clear, simple and intuitive navigation and instructions that use accessible and age-appropriate vocabulary.
- Incorporating functionality that allows learners to interact with online tuition materials at the same time as interacting with their tutor. and offers opportunities for reflection on learning.

Great caution is urged in offering online tuition to younger learners (start of Key Stage 2) and those with learning difficulties in literacy and numeracy who may lack the socialisation and cognitive skills to be able to benefit from this provision. There are few robust studies to demonstrate what is ideal in online tuition, therefore it is recommended that studies are conducted that monitor learners' achievements in online tuition.

Claire Whitehouse
Senior Research Associate

19 May 2011

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