Workshop F: Dealing with Culture in Developing an Effective Pilot Language Program for Abinitio Training

Jenny Drayton
GAL Air Navigation Services L.L.C. (UAE)

Michael Kelly
J.F. Oberlin University (Japan)

Romeo, Tango, Foxtrot: A task-based approach to meeting the diverse training needs of pilot and air traffic control trainees

Jennifer Drayton
GAL ANS Training Centre, UAE and Victoria University of Wellington
draytojenn@myvuw.ac.nz
Michael Kelly
J.F. Oberlin University, Tokyo, Japan
mikelly@obirin.ac.jp

Abstract

The needs of language learners can vary widely. In our case, cultural factors of pilot trainees in Japan, and language requirements for simulator training for air traffic controllers in the UAE underpin our course design. Yet, the approach we take to meeting these needs is similar and based on task-based language teaching. This paper summarises our conference presentation and outlines why this task-based approach is an effective tool in teaching aviation phraseology or radiotelephony (RTF) to our students. It examines the structure of a task-based lesson, the cognitive processes the method addresses and task sequencing. Justification for teaching RTF as a separate subject to maximise learning is established in two parts: by examining simulator training from a cognitive load perspective; and a brief look at the effect of workload on language production. Finally, we answer the criticism that RTF should be the domain of air traffic control and pilot instructors only.

Introduction

We believe that effective learning is achieved in classrooms where trainees are engaged and interested. To achieve this, instructors need to be creative with their lesson planning and design instruction that is student-centred. In other words, the trainee does most of the work while the instructor is a facilitator to their learning. Like many language instructors, we shy away from power point presentations which deliver material to a passive audience of learners whose only job is to listen. While this aversion is the norm for language instruction, it is, unfortunately, not always the norm for aviation training. However, many of the techniques used by language instructors could be employed in all aviation classrooms.

We had the privilege of presenting our ideas at the 2019 International Civil Aviation English Association (ICAEA) Conference in Tokyo. At the conference, Michael presented activities he uses to encourage pilot trainees to speak up. Jenny then presented a simplified excerpt from a task-based language learning unit designed to teach air traffic controllers the mechanics of ICAO mandated phraseology. The presentation concluded with an activity from Michael which looked at how he uses radios to mimic what trainees will do on the job.

While the needs of our students differ (culture vs a progression to simulator training), the techniques for training we advocate are similar.

This paper begins with a discussion of the task-based techniques Michael uses with his pilot trainees which help to overcome aspects of Japanese culture that would impede their success as pilots. He also briefly discusses how this relates to the ICAO language proficiency requirements. Then, Jenny outlines the task-based language lesson used for air traffic control trainees presented at the conference and the theoretical underpinnings of the techniques used. The air traffic control training precedes simulator training and a justification is given for teaching aviation phraseology before this training begins to clarify why we think this language should be explicitly taught.

In our presentation, we focused on the importance of teaching the ICAO mandated language pilots and air traffic controllers use to communicate. It is referred to in this paper as radiotelephony (RTF) or aviation phraseology. At the conference, it was suggested that aviation English teachers should not teach this language as it should be the domain of air traffic control and pilot instructors only. The final part of this paper is a response to that criticism.

Teaching RTF to pilots

The J. F. Oberlin University (JFOU) Flight Operations program at Oberlin University in Tokyo, Japan is a four-year program designed for students who want to pursue a career as a commercial airline pilot. The first three semesters (1 ½ years) are spent in Japan to prepare for flight training at our designated training center in the United States. Most students are Japanese and have just recently graduated from high school. All students are non-native English speakers, have no aviation training and are required to have a minimum TOEIC score of 650 to continue on to the flight training stage of our program.

Ab-initio Aviation English Training

In developing an effective pilot aviation English training program, it is difficult to balance the aviation English training needs with the time constraints imposed on the training program. The aviation English courses that have been developed in the JFOU program are task-oriented and content-based to allow students to focus primarily on the English skills required for flight training. The basic areas of aviation English study can be divided into ground operations, flight operations and technical operations and include practical topics such as chart reading, flight planning and weather briefing.

Another important area of the aviation English program is the RTF communication skills course. RTF communication should be the centerpiece of any ab-initio aviation English program because it is the communication between the pilot and the controller that requires the highest level of accuracy and proficiency.

Cultural Characteristics and RTF Communication

Cultural differences also pose problems in introducing aviation English to ab-initio students. In my experience, there are certain Japanese cultural characteristics that fly in the face of being a good pilot. For example, a professional pilot is expected to speak up, ask questions, check and confirm information that is unclear and challenge authority when needed. At the start of my course, students initially will not speak up in class. A question will not be answered unless a name is attached to it and even then, the answer is usually just a one-word response. Not only do students lack the confidence to speak English, but they are doing exactly what their culture has taught them to do and that is sit quietly and listen to the teacher. Therefore, the initial task is to get the students to break out of their cultural shell and begin acting like pilot trainees.

Workshop Activities

The activities I covered in the presentation were based on the RTF training I do with my pilot students. They are numbered activity 1 and 3 because our presentation consisted of workshop activity 1, then Jenny's lesson on RTF basics and finally, activity 3 which requires students to put the language they've learned into practice. We cherry-picked a selection of activities to demonstrate task-based activities which can be used with students and finished with the radio practice which is fun for the students, but is also an excellent way to assimilate a series of lessons in aviation phraseology.

workshop activity 1 (ATIS).

One of the first task-oriented / content-based activities that I use to help my students "speak up" and practise the pilot communication skills mentioned above ("speak-up", "exchange information" and "check & confirm uncertain information") is to copy and readout the Automatic Terminal Information Service (ATIS) bulletin. ATIS is a weather service that is broadcast on the radio for pilots. It is usually less than one minute long and contains information about the airport, weather, runways and notices to airmen. The format is very easy to learn and students learn it quickly. In this exercise, students listen and copy the ATIS. The instructor will then prompt the students to read back the information. For example:

TEACHER: Wind
STUDENTS: 1-8-0 at 1-2 knots
TEACHER: Visibility
STUDENTS: 1-0 miles

Students quickly gain confidence and can soon copy and readback the information when requested by the teacher. Interaction and fluency are soon developed while vocabulary, comprehension and pronunciation can be checked and corrected when needed. Students can also be prompted to challenge authority by having the teacher give incorrect information. For

example, saying that the wind is 4-8-0 at 1-0 knots. In this way students are challenged to speak up and confirm the incorrect information from the speaker. After some practice, mistakes can be made less obvious to further challenge and encourage students to continuously monitor information and speak up when there is any doubt or confusion.

workshop activity 3 (RTF radio work).

RTF radio work is another excellent task-oriented, content-based activity that helps Japanese students overcome their cultural differences and develop the type of pilot skills required for effective communication. In these exercises, students are taught to role-play actual RTF communication. Step by step (see below for how some of these steps can be covered), they learn the ground procedure, departure procedures and arrival procedures at their training airport. Students begin to understand the importance of timely and accurate responses to ensure a smooth interaction between the pilot and the controller. Under guidance of the aviation English teacher, the students' fluency, comprehension, pronunciation and especially interaction begin to improve. When ready, RTF role-play can begin with students sent off to different rooms with radio transmitters to act as pilots. Other students act as controllers while others track the airplanes' movements on a whiteboard. With practice, students can quickly begin to simulate transmissions that are smooth, accurate and timely. Interactions become more and more automated to the point where students begin to question incorrect or uncertain information, for example, if a pilot is given a take-off clearance when another aircraft is still on the runway. With this radio exercise, students learn to make accurate, timely responses and have the confidence to speak up when something is not clear.

Teaching RTF to air traffic controllers

The conference presentation was taken from a unit designed for trainee air traffic controllers (ATCO's) at a small tertiary training institution in the United Arab Emirates. The students the material is designed for, first complete basic training which qualifies them to work in

control towers at local aerodromes (airports), however at this stage they will not talk to pilots. In the workplace, students learn on-the-job about their airfield, the aircraft in it and will have limited duties coordinating with other aerodromes. Eventually, they return to the training centre to study in the simulator to learn to talk to pilots and manage air traffic. This is the first step towards becoming licensed ATCO's. This is also the point at which we introduce them to RTF. After this training, they return to their workplace for on-the-job training which must be completed to the required standard to gain an air traffic control licence.

The unit was originally designed in response to the fact that, in spite of international recognition that correct RTF and phraseology is essential to the safety of the aviation sector, and the complexity of its structure, RTF is rarely taught explicitly and students acquire it on-the-job and in the simulator through trial and error. Aviation phraseology is a technical language with its own set of rules that is different from the language patterns characteristic of spoken English (Campbell-Laird, 2004, 2006; Howard, 2008; Intemann, 2008; Lopez, Condamines, & Josselin-Leray, 2013; Lopez, Condamines, Josselin-Leray, O'Donoghue, & Salmon, 2013). As a consequence, it can take a few extra seconds to process what is heard and respond appropriately, although fluent use can be achieved through practice (Campbell-Laird, 2006).

To address this gap, I designed material to explicitly introduce students to the basic language required for ATC communications. It covers the aviation alphabet; numbers; the structure of an ATC conversation; read-backs; identification of the speakers; and vocabulary for simple, often-used airfield manoeuvres such as giving permission for aircraft to land and take-off. Subject matter experts were consulted throughout the development to ensure the language covered is correct. The material is based on task-based language teaching methods and the conference presentation was a simplified excerpt from the original material.

The conference presentation looked at the structure of an ATC conversation; read-backs; identification of the speakers and some simple vocabulary. It also outlined the stages of a task-based lesson. The original video was replaced with a simpler one in order to showcase more of the task-based teaching method. The presentation covered pre-task activities, the task and focus on form (i.e. grammar and language structure). These are a simplified version of the same stages as those covered in lesson 1 of the original material.

The pre-task activities used at the conference covered four stages as follows:

- Stage 1 – prime for prediction (questions were asked to revise, and get participants thinking about vocabulary which would be used later in the lesson including identifying an aircraft heading, and parts of an aerodrome);
- Stage 2 – prediction task (participants were given an aerodrome map and asked to answer the question, 'where will the aircraft go?'. They were shown some of the video, but it was silent);
- Stage 3 – preparing to report (participants were asked to write down where they thought the aircraft was going and what they thought the pilots were saying. They were encouraged to discuss this with one or two others at their table);
- Stage 4 – report (participants were asked for their answers to stage 3).

Once the participants had been prepared for the task through these pre-task activities, the task (stage 5 of the lesson) was conducted. This time trainees watched the video again to see if their predictions about where the aircraft would go and the language used were correct. Once complete, they discussed if their predictions were correct, and were asked to complete a number of questions related to the video. Again, participants were encouraged to work with others at their table and discuss their answers. Questions were asked about the language used:

- What does Deer Valley Ground mean? Deer Valley Tower?
- What is Cessna 75600?

Questions were also asked about the context of the video:

- What taxiway did they use?
- What runway?

- How many controllers were there?

Stage 6 of the lesson asked participants to think about the form of the language. They were given a cut up version of the conversation and asked to re-create it. The conversation was divided into the conversations between the ground controller and pilot; and between the tower controller and pilot. Different coloured paper was used for each speaker to help participants achieve the task (participants were encouraged to identify who each of the speakers were before re-creating the conversation). Once participants identified who was speaking, they then needed to look at the structure of each turn as well as the structure of the conversation in order to determine the correct answer. Once complete, they could check with nearby groups and finally checked their answers by watching the video again.

In the original material, completion of lesson one requires trainees to practice the aviation alphabet and numbers through a series of speaking activities and games. This was not covered at the conference due to time constraints, however slides for this are included in the power point attached to this paper. The next section outlines the theoretical underpinnings for the task-based language teaching approach used for the original material.

Theoretical Justifications

The original unit is comprised of two lessons (four hours training in total) each centred around a video. The first lesson is a video of aircraft taking off from an aerodrome and the second one is of aircraft landing at the same aerodrome. The videos were made in the simulator to give a realistic context to the audio conversation between an ATCO and a pilot. Videos are used to give the audio a 'here and now' focus and therefore simplify students' ability to understand the meaning of what they are hearing (Robinson, 2011, 2015) without reducing the complexity of the input. If students had to rely on an audio input only, it would be more difficult to interpret the meaning of what they hear because each scenario involves more than just landing or departing aircraft i.e. in the first video, an aircraft moves itself into

2nd place in line to take off when it should be 3rd; and in the second video, incorrect RTF by the ATCO results in an incoming aircraft having to go around.

The lesson structure used is provided by D. Willis and Willis (2007) for a task-based lesson. Both lessons begin with a task to prime for prediction, a prediction task, preparation to report and report before they watch the video to interpret its meaning. This is to engage the learners and ensure a real-world focus when they watch the video i.e. students are curious to find out if their ideas or predictions are correct (D. Willis & Willis, 2007; J. Willis, 2009). A vocabulary input is also included at the beginning of lesson 1 to highlight some of the words students will hear and to help ensure they understand what they are watching. These words should be revision from their previous training.

The video task is essentially an input task in that much of the language and the structure of the conversation is provided through listening (and watching) without requiring students to produce the language (Shintani, 2012). At the end of lesson 1, students are required to produce numbers and aviation alphabet and in lesson 2 they produce and practice a conversation including phrases for take-off, landing and weather; but not the more complex language required to understand each scenario. The focus on form tasks are designed to enable students to notice the peculiarities of the RTF language used. Students are asked questions about how they know if a pilot or an ATCO is speaking, how they know if a pilot has understood an instruction or how an ATCO might identify themselves the first time they speak to a pilot. These questions are designed to focus the students post-task on the forms so that their 'concern for form is heightened to… avoid error… and to push [learners] to notice something' (Skehan, 2013, p. 14). This is done because accuracy is an essential component of RTF. This point is further made in the second lesson where the use of incorrect RTF

results in a go around. Students must know why RTF is important if they are to practice the language until it is accurate and fluent.

The output required of students is significantly simpler than what is included in the videos. The required output is of items in RTF that students will use for almost every interaction they have throughout their working lives. It makes sense to drill and practice these language items first and gradually build on them to include more complex features of the RTF language for increasingly complex situations (including those encountered in the videos used for these tasks). In spite of the relative simplicity of the final task in lesson 2 (giving permission for a series of aircraft to take-off), students will need to think about the language structure, individual phrases, turn-taking, call signs, sequence of words, pronunciation and aerodrome layout to complete the task. They will also have noticed that RTF is grammatically different to English e.g. an ATCO or pilot says 'cleared for take-off' not: 'you are…' or 'I am…' cleared for take-off. Essentially, the unit sequences the tasks in order of increasing cognitive complexity to 'promote rethinking for speaking, interlanguage development and automatic performance' (Romanko & Nakatsugawa, 2010, p. 437) and to 'gradually approximate the complexity of targeted real world task performances' (Robinson, 2011, p. 8). Drilling is also used to promote fluency and automatic performance.

Further, students are asked why questions e.g. why does the ATCO ask an aircraft in lesson 1 to vacate the runway? The answer to this question is not given in the video and requires students to make inferences about the ATCO's reason for doing what he/she does. This is what Robinson (2011) refers to as intentional reasoning. These why questions increase the complexity of the task and should promote longer term retention of learning (Robinson, 2011). This complexity is achieved in the input tasks, but the output is closer to the SSARC model (Simplify-Stabilise, Automatise, Restructure-Complexify) i.e. the output from both

lessons is significantly simpler than the input (simplify-stabilise), work is done to automatise through drilling, pair practice and games, then restructured and complexified resulting in pushed output (to ultimately engage students in an ATCO/pilot conversation which is simple in terms of phraseology but requires all the elements of an RTF exchange mentioned above) (Reed, 2005; Robinson, 2015; Romanko & Nakatsugawa, 2010). Finally, students are given opportunities to plan their output at various stages in the lesson as this generally results in better overall performance (Foster & Skehan, 1999; Skehan, 2003).

The unit in its entirety satisfies the requirements of task-based language teaching as laid out by Ellis (2009). These are that: 1. The primary focus should be on meaning (students must identify what they are seeing and hearing); 2. There should be some kind of gap (e.g. students must say why the ATCO directs an aircraft to leave the runway); 3. Learners should rely on their own resources (the activities in this unit are designed to be student-centred and students must complete their tasks with minimal input from the teacher); and 4. The outcome is to direct aircraft to land i.e. it is not a language outcome. In addition, the fact that learners rely on their own resources gives opportunities for them to help each other and to re-construct and prompt one another to complete the task (Foster & Ohta, 2005) e.g. when students must re-construct the conversation in lesson 1 using a series of cards which include the phrases used by the ATCO and pilot.

Cognitive Load Theory, Workload and Simulator Training

As previously discussed, our trainees will progress from language training to simulator training which is an essential part of pilot and ATCO training. Air traffic control students learn how to manage traffic (aircraft) on the ground and in the air in a simulator. This requires them to communicate with pilots at the same time as they make decisions about traffic movement. Pilots learn to fly in a simulator, and must also communicate with

controllers from the cockpit. This section uses air traffic control training as an example of how cognitive load theory can be applied to show that training in aviation phraseology and RTF as outlined above is beneficial to trainees.

Cognitive load theory is a relatively complex theory which can be "used to investigate several instructional techniques. The theory suggests that instructional techniques that require students to engage in activities that are not directed at schema acquisition and automation, frequently assume a processing capacity greater than our limits and so are likely to be defective" (Sweller, 1994, p. 299). That is, when students learn new information, they use what is known as working memory which says that a person can process 5 to 9 pieces of new information at a time (Thurman, 1993). If the process of learning is successful, then with practice, this new information enters the long-term memory and becomes automatic (Sweller, 1994, 2016; Thurman, 1993). Automatisation means the student no longer needs to think about how to complete the task and they can do it without conscious effort, that is, without engaging their working memory (Sweller, 1994, 2016; Thurman, 1993). Since this is the case, working memory can be devoted to processing other information or decisions. However, if instruction is given too quickly or overloads the working memory, then it may take longer to learn and therefore, difficulty in a simulated task should only be increased when the current task is "well on its way to being automatised" (Thurman, 1993, p. 84). Since learning requires the use of working memory, it is important to structure it in such a way that working memory is not overloaded.

Another aspect of cognitive load theory is that the aim is to learn (and automatise) schema which is essentially a body of knowledge. Schema are made up of elements and depending on the complexity of the schema, these elements may interact and therefore need to be learned together or if interactivity is low, can be learned separately (Sweller, 1994, 2016). The implication of this, for instruction, is that tasks must be broken down as much as possible

and each part taught separately; and that automaticity must be achieved before the next skill is learned.

Cognitive load theory can be applied to air traffic control (ATC) training. A simulator is used to replicate the workplace of an air traffic controller and students are taught to direct traffic. In terms of schema, there are two overarching schemata to be learned – air traffic management i.e. the decisions about what aircraft will do e.g. when will they be allowed to land or take-off? Which runway will be used? What taxiways will be used? What heading will aircraft fly on departure? Even for routine tasks an air traffic controller must have a 4 dimensional "view" of the location of traffic in the present and make predictions about traffic movements in the future; and respond to that "picture" with appropriate decisions. The second overarching schema is aviation English which can be further divided into phraseology and plain English. Currently, two of these schemata (ATC and phraseology) are learned simultaneously in the simulator. According to cognitive load theory, this is likely to cause an 'attentional split' (Sweller, 1994, 2016) between making good ATC decisions and using the correct language to direct aircraft to carry out those decisions. That is, learners will direct their limited attentional capacity (limited because of working memory) to one or other of these schemata and the result is likely to be that learning is slowed or does not occur (Sweller, 1994, 2016; Thurman, 1993).

In fact, for second language learners especially, phraseology or RTF is a complex schema which could be learned separately. As previously stated, RTF is not a natural language and has its own abbreviations, syntax and lexicon (Campbell-Laird, 2006; Intemann, 2008; Rees, 2013) which take time to learn and automatise. This suggests that the concurrent teaching of air traffic control tasks and phraseology is likely to overload the working memory and slow down the learning process – especially for second language learners.

This is supported by research which shows that workload affects trainees' ability to produce language and this effect is more pronounced for NNES according to ability (Declerck & Kormos, 2015; Farris, Trofimovich, Segalowitz, & Gatbonton, 2008). This research lends weight to the benefit of automatizing language for the simulator prior to training to carry out pilot or air traffic control tasks. In addition, the research shows that trainees' ability to simultaneously manage workload and communication is significantly affected by language level (Declerck & Kormos, 2015; Farris et al., 2008). Language proficiency has been discussed at length elsewhere, but there are obvious implications from these findings for recruitment or provision of general language training to a level advanced enough that automatization of language for the simulator is beneficial. As Farris et al. (2008, p. 407) state "low-proficiency speakers … appear to have greater difficulty than high-proficiency speakers in using their [NNES] perception and production skills in an efficient, automatic manner". Essentially this research appears to support the tenets of cognitive load theory and it also recommends that tasks should be sequenced from simple to complex to reduce the cognitive load for the learner (Farris et al., 2008). For our pilot and ATCO trainees, the implication is that they must have a good level of general English before any of the techniques for learning RTF discussed here are useful.

Criticisms

Finally, during the conference, we were asked if it is appropriate for English teachers to teach RTF and aviation phraseology to pilot and air traffic control trainees. This is a question that was raised a number of times. We believe that English language teachers should be involved with this training with the caveat that they work closely with subject matter experts to ensure that the language taught is correct and to provide trainees with appropriate context and tasks for that language. The combination of subject matter experts and English language teachers is a good one because trainees benefit from student-centred language training using such

techniques as the task-based language teaching (TBLT) outlined in this paper, which keeps them engaged and maximises learning. They are also taught language which is accurate and mandatory for successful communication in the aviation field through the knowledge and expertise of a pilot or air traffic control instructor. We do not advocate that aviation English instructors teach RTF in isolation without the input of experts.

Conclusion

The learning needs of our students differ. In the case of the Japanese pilot students, cultural factors can interfere with good (professional) pilot characteristics such as timely responses, speaking up, asking questions and challenging authority. Conversely, the air traffic control students require language preparation prior to simulator training in air traffic control tasks. In spite of these vastly different needs, we find that task-based language teaching (TBLT) is a useful way to meet those needs. Our presentation covered a number of tasks we use in the classroom including ATIS, conversations between pilots and air traffic controllers over the radio, and a taxi-takeoff sequence to get students using aviation phraseology.

TBLT works because it is based on real-world tasks that students are likely to encounter, addresses gaps in their learning, requires trainees to rely on their own resources and results in a non-language outcome, (though, in the case of RTF, requires accurate output). Learning is enhanced by these factors, but trainees are also required to notice how the language is constructed and plan their answers, which further benefits their learning. In addition, tasks are sequenced from simple tasks to more complex to aid learning and to build automaticity of language in a step by step fashion. For the Japanese students, tasks are sequenced from ground-oriented tasks to flight communication as this seems to be the most logical for student understanding.

In many ways, the sequencing process used to teach language is similar to that used in the simulator, but tasks there are sequenced according to difficulty of air traffic control decisions. Language is not considered in this sequencing. Therefore, two different schemata are taught in the simulator and this can cause 'attentional split' if neither of these schemata is automatised. We advocate the use of TBLT to automatise the language for the simulator and reduce the cognitive load for students trying to learn air traffic control or piloting tasks and decision-making.

This paper briefly discussed the interaction between workload, language level and language output in which low level students struggle to produce language. This reinforces the language proficiency requirements discussed elsewhere and suggests that these students require a certain general English level before any of the training discussed here is effective. For aviation phraseology, instructors can monitor trainees for such factors as fluency, comprehension, pronunciation and interaction as is done with the Japanese pilots while they practise communication with air traffic control on the radio during 'ground operations' or 'flying'.

Finally, the real strength of this approach is the combination of subject matter expert (SME) knowledge and language or education instructor expertise to create a product which enhances student learning. We believe that this combination results in more effective language training and better outcomes in the simulator and during flight training.

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