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Students' attention in class: Patterns, perceptions of cause and a tool for measuring classroom quality of life

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ABSTRACT

Constructs such as engagement and flow have been well developed and studied in education contexts. Sustained attention, a distinct but related concept, has been less studied, particularly in the language classroom and foreign language medium education. In a case study involving mixed methods, student attention was measured repeatedly during a university English for Academic Purposes course. The aim was to examine whether students exhibit patterns of attention in communicative language learning classes in a similar manner to lectures and to examine attention patterns based on interaction types (group work, individual work, full class). Repeated surveys were used to reveal what students perceived as detrimental to attention and the perceived value of exercise breaks. Results suggested significant changes in attention over time and between teacher talking time, group work and individual interaction types. The study design itself forms an effective tool to improve classroom life including teachers' monitoring of class dynamics, and for students, as a means of self-reflection to increase learning performance.

Keywords: attention, flow, student engagement, language learning, learner training, feedback on teaching

Introduction

A teacher's ability to promote student attention in the classroom is essential to quality education, yet there are many practical questions in how to achieve this (Baker & Brown, 2013). Teachers want their students' attention, yet neuroscience tells us that attention is a limited resource (Isbell, et al., 2017). Students cannot maintain attention for an entire one- or two-hour class. However, teachers and students increasing their awareness of attention might assist their management of the classroom experience. Various figures from research provide estimates on how long students maintain attention for. For example, in the case of teacher-centred activities, students' attention is widely believed to be sustained for about fifteen minutes, although with high individual variation (Wilson & Korn, 2007). Attention may be lost extremely quickly in lessons e.g. in the first thirty seconds (Bunce, Flens, & Neiles, 2010). Other research, mostly in lecture contexts, makes claims about peaks and declines in attention throughout a class, interpreted via measurement of attention lapses (frequency and length of lapses); these lapses tend to increase in frequency and length after an optimum concentration period somewhere between five and fifteen minutes into the lesson (Bligh, 2000; Bunce, Flens, & Neiles, 2010; Lloyd, 1968; Johnstone & Percival, 1976, cited in Hlas, Neyers, & Molitor, 2019). Sustaining attention in foreign language classes has been the subject of far less study (Hlas et al., 2019), a finding supported by a search of education and psychology databases. There are important additional factors to consider such as student language proficiency, listening ability, and the different format of lessons – less lecturing, more student activity. One rare recent piece of research in a foreign language context by Hlas et al. (2019) did consider attention across a variety of classes and levels involving Spanish as a second or foreign language. Some of these classes were language learning classes and some were subject instruction with Spanish as a foreign language as the medium of instruction. The researchers examined frequency and duration of attention lapses. Findings indicated a pattern of attention and attention lapses correlated with task type, timing (stage in the lesson), and duration. For example, they found lower attention when the teacher or other students were speaking, higher attention when working and discussing in groups or in full class when the teacher randomly called on students by name to answer questions (Hlas et al., 2019).

With attention having been the subject of education research, it is worth contextualising this in relation to another related, but more heavily researched, concept in education research known as engagement, and importantly understanding the distinction between the two. Attention is conceptualised in neuroscience literature under a variety of headings depending on the exact processes and parts of the brain involved (Menon & Uddin, 2010). Of particular interest in this study was the process of *sustained attention* because this has been identified as a vital predictor of academic learning (Sarter, Givens, & Bruno, 2001). Sustained attention involves the ability to stay focused, "suppressing the processing of irrelevant, competing distractors" (Isbell et al., 2017, p.9247). It is a limited resource, meaning that it runs out (Isbell et al. 2017) for reasons such as fatigue (Faber, Maurits, & Lorist, 2012). Studies of attention and distraction such as by Bunce et al. (2010) and Hlas et al. (2019) on which this study builds, focus on *sustained attention* as most appropriate for measurement in the classroom.

Sustained attention is positively affected by, among other things, high perceptual load, particularly visual (de Fockert, Rees, Frith, & Lavie, 2001) but is negatively affected by high demands on working memory (de Fockert et al. 2001; Sarter et al., 2001). It is believed that executive function (the brain's manager or a person's self-control) has insufficient resources left to distinguish between targets and distractors and so can no longer manage appropriate focus (Lavie, 2005). This is in tune with engagement and motivation theories that promote the use of challenging tasks provided these tasks are achievable (e.g. Egbert, 2004). The key difference between attention and engagement is that the former is a single dimension of cognitive activity, known as the salience network (Menon & Uddin, 2010) while the latter is a meta-construct often involving three dimensions: behavioural; emotional/affective; and cognitive. Attention appears within this meta-construct under behaviour, while many other factors are also considered important, such as happiness, interest and value under the heading emotion (Fredricks, Blumenfeld, & Paris, 2004). The most developed and well-known explication of engagement is *flow theory*, originally developed by Csikszentmihalyi (see Graef, Csikszentmihalyi, & McManama Gianinno, 1983 for example). Engagement, it is commonly argued, is promoted by student-centred educational approaches and active learning (Mann, 2001). This is mirrored in attention research: that student-centred approaches result in less mind wandering (Bunce et al., 2010; Hlas et al., 2019). In language learning contexts, since the development of communicative approaches in the late 1960s, student activity in the classroom has been seen as something to maximise, with teacher talking something to minimise (Howatt & Widdowson, 2004). English for Academic Purposes (EAP) practitioners are inheritors of this communicative approach, while their position as language teachers in academic contexts has also been influenced by the rise of constructivism and its becoming the dominant theory of learning in education generally (Liu & Matthews, 2005). Thus, EAP practitioners have for all these reasons sought to maximise student activity; to maximise communication and language practice; to construct knowledge; to be autonomous (including managing and regulating one's own learning) (Dickinson, 1995). My research came about within this theoretical framework; that classrooms, particularly language classrooms, should be student-centred to maximise attention/minimize mind-wandering, while showing accord with beliefs and findings from other dimensions of flow theory, from constructivism, and from the communicative approach.

Aims

This case study arose largely from a desire to develop a rich picture of student attentiveness in a typical EAP pre-sessional classroom, conducted as practitioner exploratory research to understand classroom life (Allwright, 2005), done under an interpretivist paradigm to take account of the individual and context dependent perspective of students. The specific aims were to understand students' patterns of high and low attentiveness throughout their one-and-a-half hour lessons, measuring these by time and by interaction type (group work, individual work, and whole class activities). I wanted to find out if, in the case of timing, patterns of attentiveness were in line with research in lecture contexts. In the case of interaction type, I wanted to uncover whether there were significant differences in attention; one might expect highest attention during group work under the belief that this will involve active learning, with lowest attention expected during teacher talking when students might be more passive. I also wanted to introduce short exercise breaks into the classroom, exercise being known to boost attention (Donnelly & Lambourne, 2011) and promote cognition (Watson, Timperio, Brown, Best, & Hesketh, 2017).

Methods

The research was conducted over four weeks in Spring 2018, following ethical approval, with thirteen students at approximate International English Language Testing System (IELTS) English level 5.5 (low B2 on the Council of Europe Framework of Reference) during academic reading and writing classes of pre-sessional English. This level usually requires a further three months of full-time English study to be admitted to a Master's programme in a UK university. Pre-sessional English classes are designed to provide this full-time language study and prepare students for academic tasks such as reading journal articles and writing essays.

Participants were students from China and the Middle East, aged between twenty-three and thirty. All classes took place in English – students were studying English language and English was the medium of instruction. The sample was a convenience sample but is representative of typical pre-sessional students in most UK institutions.

Mixed methods were employed, with a greater reliance on structured qualitative data than unstructured (De Vaus & Ebooks Corporation Limited, 2012) to enable a direct and non-intrusive focus on attention. The tools for collection of these data are referred to as attention probes (Farley, Risko, & Kingstone, 2013), and were measured on a 6-point scale: 1-6, with 0 (zero) given for tuning out (thinking about something else) and 1-6 indicating degrees of attentiveness. Typical approaches to measuring perceptions of attention in class or laboratory studies have involved students monitoring their own attention or, alternatively, prompts (called 'probes') whereby students are asked periodically to assess their attention. The choice of methods was influenced by work done by Farley et al. (2013) for probing student self-assessment of attention lapses and grading the *shades* of attentiveness on the scale. Investigations into engagement, e.g. flow studies such as by Shernoff, Csikszentmihalyi, Schneider, & Shernoff (2014), have more complex tools and these were eschewed in favour of classroom probes for minimum disruption and a direct focus on attention. Engagement measurement tools typically use experience sampling (e.g. Hektner, Schmidt, Csikszentmihalyi, 2007) and these would introduce other factors such as students' feelings and be a confounding variable by the distracting effect resulting from students completing the tools. Interpolation tests

(testing what students read, heard, or understood at particular times) have been used both as a measure of attention and as a means to improve attention (Szpunar, Moulton, & Schacter, 2013) but these would be difficult to interpret since recognition and understanding in a second language is more likely to involve a variety of factors not related to attention e.g. language proficiency.

A problem to negotiate before data were collected was to define the construct *attention* for students and then to have students measure it reliably. The simplicity of the probe tool meant that common approaches to improving reliability that could be analysed with Cronbach's alpha would not work, yet students might understand the term very differently: *concentration* or *alertness* might be more understandable, for example. In terms of measurement, it should also be noted that studies have measured attention as binary (were you attentive – yes or no) (e.g. Bunce et al., 2010), while it has also been graded (e.g. Hlas, et al., 2019; Farley et al., 2013). It was decided to use a six-point Likert scale for considerations of validity and ease of use (Devlin, 1993 cited in Douglas, Douglas, & Barnes, 2006) to grade level of attention and discriminate between tuning out and shades of attentiveness (0 = tune out i.e. self-aware or even intentional mind wandering, and 1-6 = shades of attention from low to high).

To minimise the potential problems in validity and reliability, a focus group was set up inspired by positive psychology (Lee Duckworth, Steen, & Seligman, 2005) whereby students were asked, prior to any attention probes, to consider a hobby or task on which they can concentrate well with few distractions. They were then to consider another hobby or task and compare them, then consider something they struggle to maintain concentration on, and give all these activities a score of attention 1-6. They were then asked to consider times when, in class, they are thinking about other things such as dinner or shopping – these times were to be given a 0 score to represent tuning out. Students were given the chance to discuss together. The focus group technique also reduced the risk of language or translation difficulties interfering with student understanding of the tools. For example, they were given the chance to brainstorm factors affecting attention before comparing with the surveys that they would subsequently use.

Students were probed at the end of three interaction types: i) full-class interaction (labelled *TT* for teacher talking although often in reality involving student contributions full-class); ii) Group Work (from pairs up to groups of five – *GW*), and iii) Individual tasks (*I*). Examining attention via self-conscious methods gave students the opportunity to explore and reflect later on the factors that affect attention, which it was hoped might also provide tools for them to improve their learning performance in the same way that meta-cognition and reflection are generally valued in education. In a final questionnaire at the end of the four-week study, students were asked about this specific point i.e. whether they valued paying attention to attention.

In terms of ways to triangulate the data, tools were influenced by Hlas et al.'s (2019) use of survey questions. Students were given surveys on each day their attention was measured to learn more about to what students attributed poor attention. Surveys were supplemented by a focus group before and after the attention probe phase, and a questionnaire containing unstructured and structured questions. These questionnaires were administered on eight occasions. In an attempt at saturation, the research was carried out in eleven classes over a four-week period.

Results

Was interaction type (GW, I, or TT) a factor in attention?

The differences in attention score are not high; see figure 1 for mean scores. An analysis of variance (repeated measures ANOVA) was carried out, which indicated statistical significance $F(2,24)= 27.351$, $p=0.000$ with the LSD post hoc test showing the significance was between TT and others, not between GW and I.

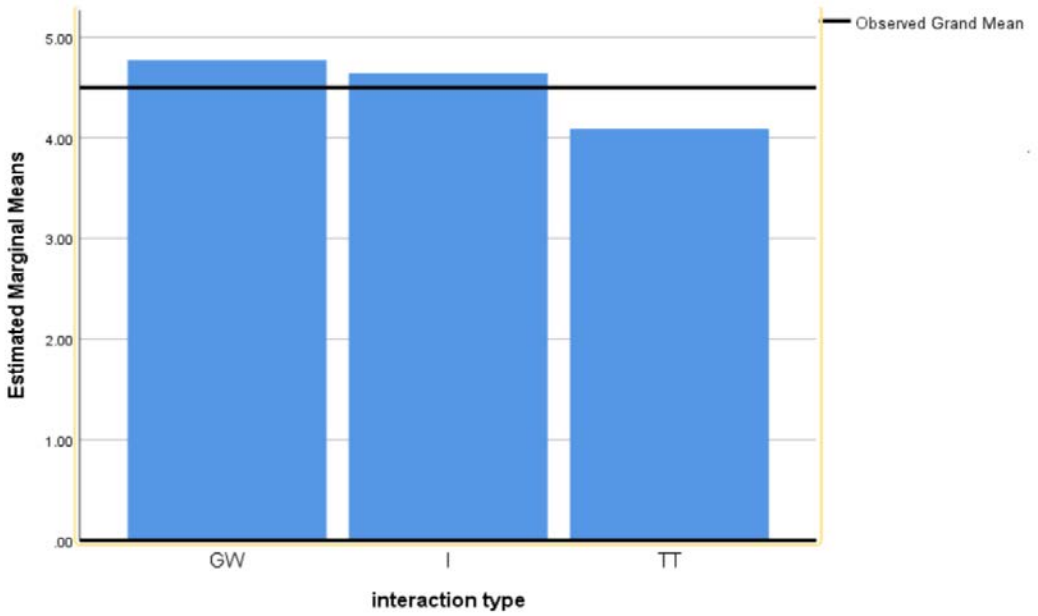

Figure 1: Overall mean score of student attention by interaction type.

Mean and Standard Deviation for Figure 1

	N = students, n=individual measures	Minimum	Maximum	Mean	Std. Deviation
Group mean	N=13, n=169	4.18	5.60	4.7686	.39942
I mean	N=13, n=363	3.70	5.40	4.6381	.40409
TT mean	N=13, n=504	3.41	4.65	4.0869	.42943

Table 1 Mean and standard deviation for figure 1.

Students' attention scores were generally lower during full class (TT) interactions, such interactions primarily involving the teacher talking, though also including question and answer elements between student and teacher. The importance of these results is their consistency with other studies such as those mentioned in the introduction, perhaps justifying the popularity of student-centred approaches to the classroom. However, they also indicate that differences are small (TT mean attention was only around 11% less than group work). Despite the necessary caveat about the small sample and margin of error, results of repeated attention measures showed that for all interaction types, a low attention score was rare, but occurred in all interaction types including group and individual work (see table 2) where students may give the impression of engagement without being engaged. Mayer (2004) makes an important warning, in the context of constructivist methods of teaching, that methods in the classroom should be evaluated based on how much thinking students are doing ("appropriate cognitive processing") rather than how much doing or discussing is happening (Mayer, 2004, p.17).

interaction type	total scores collected		number of 2s	number of 1s	number of zeros	total number of lower scores	percentage of total that is 2 or less
Group	169		1	0	2	3	1.76
I	363		16	3	4	23	6.34
TT	504		27	12	8	47	9.33

Table 2: Lower-end individual attention scores (0-3) by interaction type

Was the stage of lesson/time a factor in attention?

Lessons were divided into stages for the purposes of analysis based on which part of the one and a half hours attention was measured. The key to stage labels is in table 3 below.

Stage	Time	N=13, n= total number of measures/scores taken
1	Zero to 5 mins	n=0
2	5 to 10mins	n=35
3	11 to 15 mins	n=85
4	16 to 30 mins	n=175
5	31 to 45 mins	n=161
6	46 to 60 mins	n=202
7	61 to 75 mins	n=135
8	Last 15 mins to final 5 mins	n=102
9	Final 5 mins	n=82
10	Class end and overtime	n=59

Table 3: Key to lesson stages (time in lesson)

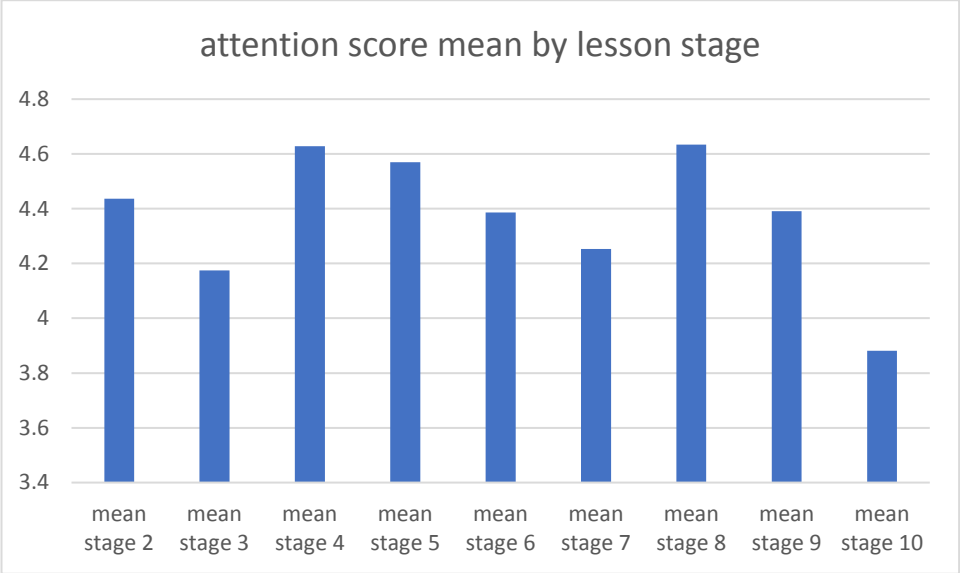

Figure 2: Mean student attention by lesson stage

Figure 2 shows that attention peaks and dips, consistent with research outside of foreign language learning contexts. For example, a peak around fifteen minutes into the lesson is highly consistent with research cited in the introduction. However, in contrast to some research on lectures, e.g. Farley et al (2013), there was not a continuous drop off throughout the lessons from that point. One important difference with that research is that it focuses on time on task, whereas the typical language classroom involves a variety of tasks. Data for attention and time on task was collected but not analysed due to insufficient data by variables (e.g. GW attention probes where time on task ≤ 5 minutes, n was 1).

The data show that attention dips at the end of the lesson but is high ten minutes prior to the end. Tuning out (a score of '0', not shown in figure 2) appeared more often at the end of a lesson; eight out of a total fourteen tune-out (0) scores were given by students in stages 9 or 10 i.e. at or very near the end of the lesson. A one-way ANOVA indicated statistical significance $F(8, 96)=3.787$, $p=0.001$ with LSD post hoc test confirming where the main differences between stages were, most noticeably between stage 8 (fifteen to five minutes before the end of the lesson) and 10 (exactly at the allotted end time or any time past the end time); there was a large drop from stage 8 to stage 10.

The pattern observed in figure 2 can be seen in more detail from a plot of individual mean scores in figure 3 below. Ten of thirteen students showed a mean drop between stages 8 and 10, with only two showing a rise.

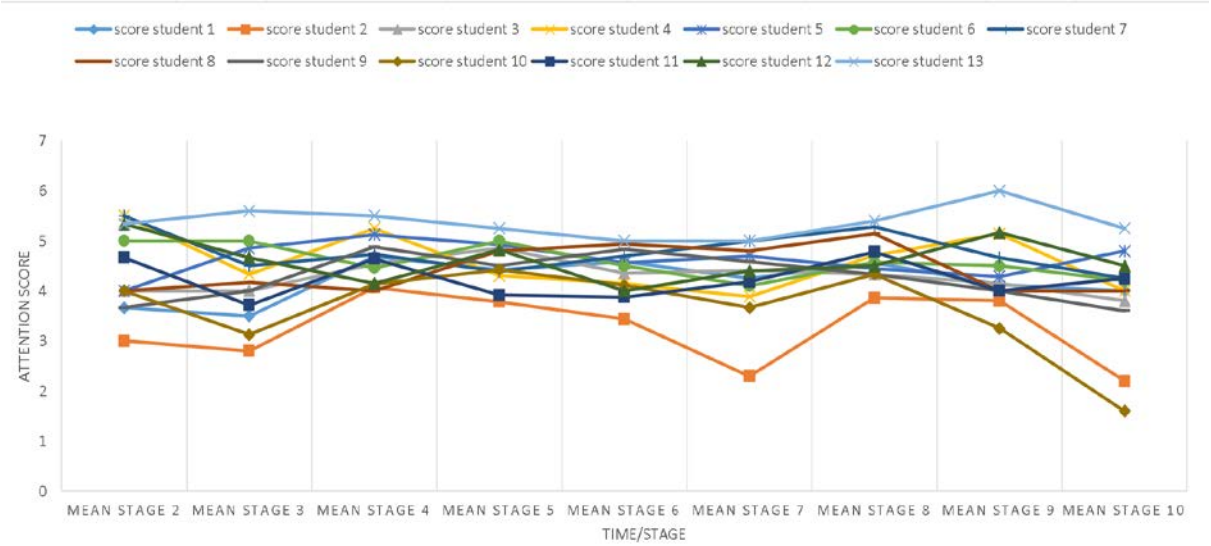

Figure 3: Individual student attention score means by lesson stage

What factors did students believe damaged attention in class?

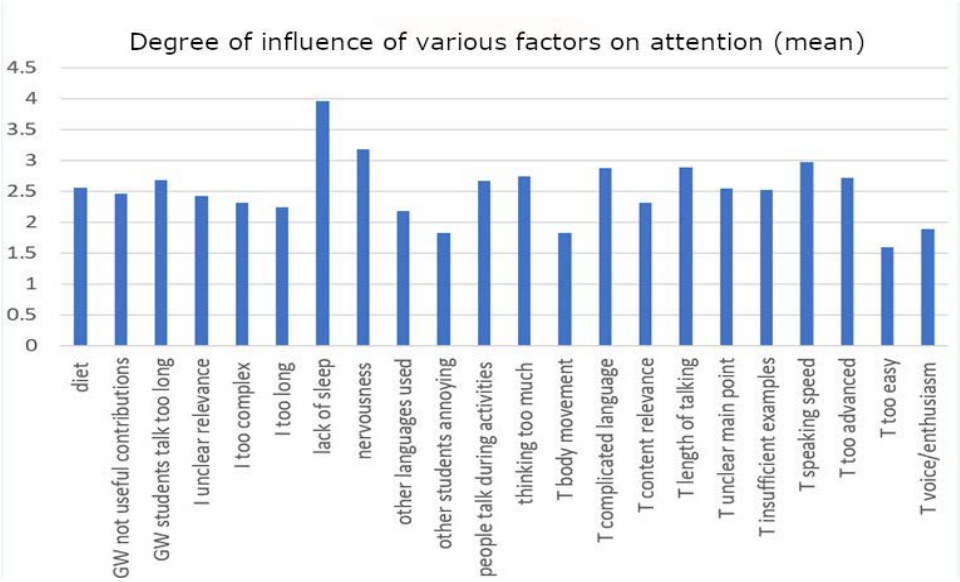

Figure 4: Student perceptions on the degree factors affected attention

Students were asked to complete a survey which included questions on the factors they believed damaged their attention. They were asked to complete the survey on eight occasions, resulting in up to 104 responses feeding into each individual factor's scoring, as illustrated in figure 4. They were asked to give a score of 0 to 9; a high score indicates they considered this factor detrimental to sustained attention in class. The mean scores illustrated in figure 4 indicate personal/internal factors *lack of sleep* and *nervousness* as the main causes of poor attention, while in third and fourth place, some way behind, were *teacher talking time* and *speed of teacher talking*. These surveys were often completed some hours after the lesson and would do no more than indicate student perceptions or feelings. It is also worth noting, perhaps reflected in the low scores on a scale of 0 to 9, that on many occasions students would give a score of 1 or zero or skip a factor. To add some depth to figure 4 data, a count was made of the number of times students gave a score of 2 or more to a factor to give a better sense of how common that factor was, even if not considered by the student to be highly influential. Table 4 shows these data, generally reinforcing figure 4 but highlighting that the manner of teacher delivery becomes more conspicuous, perhaps on account of the English level of students. Also, another aspect of student anxiety is present – *thinking too much about what they wanted to try to say.*

The factors set out in the surveys for structured qualitative data collection were chosen based on a synthesis of neuroscience literature on sustained attention. Their similarities to aspects of engagement will be apparent e.g. level of challenge (*too advanced* or *too easy*), but there are others not connected to most engagement measures e.g. *diet*, and irritants or distractors (e.g. *other students talking too long* or *people talking during activities*).

Factor	Number of times students scored this at more than 1
Lack of sleep	59
T: Teacher speed of talking	55
T: complex language of teacher	54
Thinking too much about what I want to try to say	54
T: Teacher talking too long	53
GW: Other students talk too long	52

Table 4: number of times students gave this factor a score of more than 1: top 6 most commonly scored factors above 1

Did students enjoy exercise breaks?

In the eight surveys, students were asked if they enjoyed short exercise breaks. Results are in table 5 below.

yes	46 agree
no	5 agree

(n 51 responses across the 13 students)

Table 5: did students enjoy exercise breaks

Did students feel they benefited from paying attention to attention?

Students were asked in a final survey whether they felt they benefitted from paying attention to their attention patterns and the causes of poor attention. Nine out of thirteen students completed this question. Eight out of nine felt there were intrinsic benefits.

	Responses out of 13 participants
yes	8
No	0
Maybe	1

Table 6: Do students think they benefitted from attending to attention

Limitations

As a case study, predominantly structured qualitative data prevents thorough exploration of causes, and quantitative data with only thirteen students highlights limitations in terms of transferability of results. Further, as the research was conducted during normal class time working towards course learning objectives, it was not possible to isolate variables in a quasi-experimental design or include a control group to account for possible mediator variables such as the Hawthorne effect, although the unobtrusive nature of the probes and decreasing novelty (constant use of the same unobtrusive test) would minimise any such effect (Adair, 1984). The results are stronger, however, in the credibility and dependability of the data. Students were introduced to the construct *attention* through examples and discussion/focus group before the study started, and through eight repetitions of the same procedure with a brief reminder on each occasion what was being measured. Observing individual students' patterns of attention vis à vis interaction and lesson stage/timing indicate very strong similarities across nine out of thirteen students and results are in line with other research (e.g. that cited by Hlas et al., 2019), even though self-monitoring by students without prompts could have given additional insights at a more granular level of time. Surveys on perceptions of causes of poor attention would provide more useful data if completed at the time of the attention probes, but would cause increased distraction and possibly introduce a confounding variable (as mentioned in the introduction in contrasting attention probes to measures of engagement).

It is important to stress that this research was carried out on students with a B2 level of English which may influence student attention and preferences: B2 is not fluent and means students undergo greater cognitive load and demands on working memory than higher level students e.g. C1 and above. Also, as this study was carried out in a reading and writing class, choices of activity types within individual and group tasks were influenced by a focus on reading and writing.

Discussion and Conclusion

Despite the small sample size, results are in line with previous research indicating higher sustained attention in interactions that are student-centred (see e.g. Bunce et al., 2010). Further, the data is in line with previous research indicating rising and falling attention throughout a class, with individual variation (Wilson & Korn 2007). With the methods (summative self-scored attention at the end of interactions) and context (small sample, foreign language medium) limiting transferability of results, the question arises as to what meaning these results provide teachers beyond what good intuition and observation might tell them. The first point in responding to this question is to emphasise that the results are consistent with the existing view that attention is not highest near the start of a lesson (first ten minutes) and that there is not necessarily a drop in attention that takes place throughout a class; rather, a wave-like pattern is observed. This consistency with other studies also lends credibility to the results showing that attention is not particularly low near the end of a lesson (from the final fifteen minutes to the final five minutes), though there is notable increased tuning-out and low attention after the final five minutes. Thus, the observations from this case study are suggestive that language classes or studying in a foreign language follow the same patterns as classes in a first language, at least for level B2 and higher. In terms of interaction type, student-centred

approaches are supported by there being higher attention in individual and group work activity. However, caution should be exercised, as highlighted by Mayer (2004), since scores reveal high variation (table 1) and even the mean scores show a difference of only around 11% between teacher talking time and group work. Some teachers may accept this as self-evident, while others will benefit from this being highlighted: that student activity does not indicate engagement. Indeed, work most associated with Kirschner (e.g. Kirschner, Sweller, & Clark, 2006) expresses major concerns about student-centred learning and has been the subject of increasing research in recent years (e.g. Andersen & Andersen, 2015)

The second point in relation to transferability of the findings from this research is perhaps of greater interest, which relates to the use of the methods themselves in classrooms. As touched on in the introduction on the difference between attention and engagement, attention is not multi-dimensional like engagement. Measuring engagement requires complex tools e.g. in an analysis of twenty-one engagement tools used in American schools, surveys were typical and length of time to administer tended to range between fifteen and thirty minutes (Viadero, 2011). Engagement understood through the flow framework focuses on actions (and also characteristics) of individuals who achieve a flow state (Nakamura & Csikszentmihalyi, 2009) with interest in attention being around the structural conditions of an activity (Nakamura & Csikszentmihalyi, 2002). Flow and engagement have been built on by others, most notably Dornyei, who have a particular interest in expanding the focus from cognition to encompass motivation, which might include traits of learners and longer-term goals (for example Wen & Ahmadian, 2019), values and beliefs, and the psychological need for self-determination and autonomy (Deci & Ryan, 2010).

While flow sees attention as an essential condition, it appears as a product of the individual's relationship to an activity (Nakamura & Csikszentmihalyi, 2002). By contrast, sustained attention concerns the interaction of top-down and bottom-up attention, only partly about the individual's relationship to an activity or task and in large parts about a long list of environmental factors, some of which are controllable by the teacher e.g. challenging (but not overchallenging) tasks, some of which are not e.g. nutrition and sleep. Many of these factors were selected for the student surveys and as we have seen, lack of sleep was students' most chosen factor. Attention is viewed from biological perspectives (specifically neuroscience) and measured much more simply i.e. as a single dimension – activity in the *salience network*, observed through brain imaging studies (Menon & Uddin, 2010). Such technology is not currently realistic for a classroom setting but the probes for self-assessed attention used in this and previous studies are, as previously mentioned, non-intrusive. They are also efficient, taking a few seconds to complete, and require participants/students to address a simple question: to what extent were you attentive? They are not being asked about several dimensions related to feelings, interests, motivation etc. The resulting attention scores can be interpreted by students themselves at a later stage, including their views on how much learning they felt they did. This is not to suggest that engagement measures should be replaced, merely that attention measures offer an alternative focus. While they may not offer much direct insight into materials, student interests, motivation, etc, they present a quick snapshot for the teacher and the students for further exploration regarding causes. The initial stages of this further exploration were attempted in this study via follow-up surveys, which in future could be expanded to take account of other engagement conditions.

Measuring attention via probes and following up with surveys provides a worthwhile combination of tools to utilise in attempting to improve classroom life. This group of participants viewed personal factors such as lack of sleep and nervousness in class as the main causes of poor attention. These may not be the causes, but in a case study to understand classroom life, it is important to introduce a measure of how students perceive their own experiences, which is missing from most of the literature looking at attention in the classroom. Language teachers, in particular, need to be concerned about fatigue caused by activities themselves and about anxiety, long recognised as a key obstacle in language learning contexts (Horwitz, Horwitz, & Cope, 1986). Future research examining perceptions concurrent with the attention probe could improve the validity of the measure but runs the problem of complicating the attention measure.

Considering the possibility of using attention measurement as a form of classroom assessment technique (known as *CATs*: Cross & Angelo, 1988), I subsequently used the tool in several classes for exactly this purpose and its advantages compared to many other CATs was its simplicity and speed. Attention probes provide a tool that enables moment-to-moment feedback, or end of class feedback, on effective classroom management and input design. Flow-type measurement techniques already provide many ideas for exploring student experiences, despite the previously mentioned problems regarding their complexity, but neither those nor attention can, in themselves, tell us about the quality of learning (e.g. high attention and/or high-engagement can be present when activities are fun, challenging, seem to be relevant to that learner and the task, etc but we would still not know what students take home). Many classroom assessment techniques do look at student comprehension (see for example Cross & Angelo, 1988), but this can be a problem in language classrooms since insufficient linguistic ability will clearly affect responses to techniques such as interpolation tests or paraphrasing lesson content (Cross & Angelo, 1988). Thus, there is no perfect approach to balancing the measurement of attentiveness, the level of engagement, and the level of learning. Nonetheless, these attention tools give us a starting point for further exploration and may have an intrinsic benefit in themselves: eight out of nine responses in students' final surveys believed that paying attention to attention had a positive effect on their studies. Attending to attention is being increasingly studied in neuroscience and there is growing awareness of *neuroplasticity* and *self-directed neuroplasticity* - the idea that people can systematically alter, to improve, neural circuitry associated with a variety of mental and physical states (Schwartz, Stapp, & Beauregard, 2005). Using attention probes in class and asking students to reflect on their attention in class may thus have important benefits beyond being a useful addition to the range of CATs promoted by Angelo and Cross (1993) and others. Lastly, it should not be overlooked that students valued the inclusion of an exercise break, the benefits for attention being well-known (Watson et al., 2017).

Appendix I – Data Collection form for attention probes

DATA COLLECTION – ATTENTION DATE

Participant: _____ (put last 4 digits of your library card)

Activity **TT** **I** **G**	**Time / Stage / Details**	**Code 0-6** **0=thinking about something else 1=mind unfocussed** **2=struggling to pay attention 3=paying attention but struggling to follow/understand** **4=fairly well focussed** **5=well focussed** **6=fully engaged**
G	*11:50 discussion on reading strategies*	*3*
I	*12:03 reading abstract*	*0*

Appendix 2 – Data Collection form for attention probes

REFLECTIVE LOG / QUESTIONNAIRE date _____

1.1.1.1 ***Put here the last four digits of your library barcode _____***

Please write down your reflections on today's class. You can write free text, or you can respond to the prompts below:

a) Comment for the class **generally**:

I think generally I paid attention (1 very badly, 2 badly, 3 ok, 4 well, 5 very well)

b) Review your attention scores for the lesson; would you say a high attention score equates to satisfaction with that part of the lesson? (1 yes I mostly agree, 2 no I mostly disagree, or DK -I don't know)

c) Give your opinion on the exercise break. Choose **yes**, I liked it, or **no**, I didn't like it.

YES / NO

d) Here is a list of factors that often damage attention. Give a number between 0 and 9 to all items to indicate how much you think they damaged your attention 0= not a factor 9 = a highly important factor. The table has been divided into the three types of interaction pattern: Teacher talking (TT); Group work (GW); and Individual work (I); and other factors

Teacher talking:

Length of time teacher talking	
Teacher used very complicated language	
Teacher spoke quickly	
Teacher didn't give enough concrete examples	
Teacher gave concrete examples but didn't make clear the main ideas/the main point	
Teacher's voice / lack of enthusiasm	
Teacher's body movement	
Content of what teacher said was NOT obviously useful/relevant to me	

Content of what teacher said was TOO easy	
Content of what teacher said was TOO complex/advanced	

Group work (things other students did that caused me to lose concentration)

Other student(s) talked for TOO long	
Other student(s) talked about things that I did NOT find useful (or I did NOT understand the value of those things)	
Something else – please specify and give it a score • • •	

Individual work (things that caused me to lose concentration)

It wasn't obvious why I was doing the task	
The task was TOO easy	
The task was TOO complex/advanced	
The task was TOO long (too much time)	
Something else – please specify and give it a score • • •	

Any other factors that you would like to mention

Not enough sleep	
Other students or teacher saying things that annoyed me;	
Thinking too much about what I wanted to say;	
Use of other languages other than English in the classroom;	
Diet/food/breakfast/lunch e.g. hungry; ate too much	
Nervousness, stress	
Teacher or others talking during activities while I tried to concentrate	

Put here the last four digits of your library barcode **Date:** _____

Homework:

After you do a study (English) task at home for approximately 1 hour 30 minutes, make some comments below about your reflections on your attention:

How well did you stay focussed (maintain vigilance/attention) for the time of the task?

What things damaged your attention?

Were you thinking of anything else when your attention to the task was low?

What would you do differently next time to improve your attention for a similar length of English task?

Biography

Neil Allison is a lecturer in English for Academic Purposes at University of Glasgow. He originally trained as a lawyer and now much of his focus on English in Academic contexts is focused on legal English. For several years he taught English as a foreign language to various proficiency levels of students.

References

Adair, J. G. (1984). The Hawthorne effect: A reconsideration of the methodological artifact. *Journal of Applied Psychology*, 69(2), 334-345. doi:10.1037/0021-9010.69.2.334

Allwright, D. (2005). Developing principles for practitioner research: The case of exploratory practice. *The Modern Language Journal*, *89*(3), 353–366.

Andersen, I. G., & Andersen, S. C. (2015). Student-centered instruction and academic achievement: Linking mechanisms of educational inequality to schools' instructional strategy. *British Journal of Sociology of Education*, *38*(4), 533–550. https://doi.org/10.1080/01425692.2015.1093409

Angelo, T. A. & Cross, K. P. (1993). *Classroom assessment techniques: A handbook for college teachers* (2nd ed). San Francisco: Jossey-Bass

Baker, R. L., & Brown, D. P. (2013). On Engagement: Learning to Pay Attention. *University of Arkansas at Little Rock Law Review*, *36*, 337.

Bunce, D. M., Flens, E. A., & Neiles, K. Y. (2010). How long can students pay attention in class? A study of student attention decline using clickers. *Journal of Chemical Education*, *87*(12), 1438–1443.

Cross, K. P., & Angelo, T. A. (1988). *Classroom Assessment Techniques. A Handbook for Faculty.* University in Ann Arbor, Michigan: National Center for Research to Improve Post-secondary Teaching and Learning.

de Fockert, J. W., Rees, G., Frith, C. D., & Lavie, N. (2001). The Role of Working Memory in Visual Selective Attention. *Science*, *291*(5509), 1803–1806. https://doi.org/10.1126/science.1056496

De Vaus, D. A., & Ebooks Corporation Limited. (2012). *Surveys in social research* (6th ed.). London: Routledge.

Deci, E. L., & Ryan, R. M. (2010). Intrinsic Motivation. In *The Corsini Encyclopedia of Psychology* (pp. 1–2). American Cancer Society. https://doi.org/10.1002/9780470479216.corpsy0467

Dickinson, L. (1995). Autonomy and motivation a literature review. *System*, *23*(2), 165–174.

Donnelly, J. E., & Lambourne, K. (2011). Classroom-based physical activity, cognition, and academic achievement. *Preventive Medicine, 52*, S36-S42. doi:10.1016/j.ypmed.2011.01.021

Douglas, J., Douglas, A., & Barnes, B. (2006). Measuring student satisfaction at a UK university. *Quality Assurance in Education*. https://doi.org/10.1108/09684880610678568

Egbert, J. (2004). A study of flow theory in the foreign language classroom. *Canadian Modern Language Review*, *60*(5), 549–586.

Faber, L. G., Maurits, N. M., & Lorist, M. M. (2012). Mental fatigue affects visual selective attention. *PloS One*, *7*(10), e48073.

Farley, J., Risko, E., & Kingstone, A. (2013). Everyday attention and lecture retention: The effects of time, fidgeting, and mind wandering. *Frontiers in Psychology*, *4*, 619.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School Engagement: Potential of the Concept, State of the Evidence. *Review of Educational Research*, *74*(1), 59–109.

Graef, R., Csikszentmihalyi, M., & McManama Gianinno, S. (1983). Measuring intrinsic motivation in everyday life. *Leisure Studies*, *2*(2), 155–168.

Hektner, J. M., Schmidt, J. A., & Csikszentmihalyi, M. (2007). *Experience sampling method: Measuring the quality of everyday life*. London: SAGE.

Hlas, A. C., Neyers, K., & Molitor, S. (2019). Measuring student attention in the second language classroom. *Language Teaching Research*, *23*(1), 107–125.

Horwitz, E. K., Horwitz, M. B., & Cope, J. (1986). Foreign Language Classroom Anxiety. *The Modern Language Journal*, *70*(2), 125. https://doi.org/10.2307/327317

Howatt, A. P. R., & Widdowson, H. G. (2004). *A History of ELT, Second Edition*. Oxford: OUP.

Isbell, E., Stevens, C., Pakulak, E., Hampton Wray, A., Bell, T. A., & Neville, H. J. (2017). Neuroplasticity of selective attention: Research foundations and preliminary evidence for a gene by intervention interaction. *Proceedings of the National Academy of Sciences*, *114*(35), 9247–9254. https://doi.org/10.1073/pnas.1707241114

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, *41*(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1

Lavie, N. (2005). Distracted and confused?: Selective attention under load. *Trends in Cognitive Sciences*, *9*(2), 75–82. https://doi.org/10.1016/j.tics.2004.12.004

Lee Duckworth, A., Steen, T. A., & Seligman, M. E. (2005). Positive psychology in clinical practice. *Annual Review of Clinical Psychology*, *1*, 629–651.

Liu, C. H., & Matthews, R. (2005). Vygotsky's Philosophy: Constructivism and Its Criticisms Examined. *International Education Journal*, *6*(3), 386–399.

Mann, S. J. (2001). Alternative perspectives on the student experience: Alienation and engagement. *Studies in Higher Education*, *26*(1), 7–19.

Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? *American Psychologist*, *59*(1), 14.

Menon, V., & Uddin, L. Q. (2010). Saliency, switching, attention and control: A network model of insula function. *Brain Structure and Function*, *214*(5–6), 655–667.

Nakamura, J., & Csikszentmihalyi, M. (2002). The Concept of Flow. In *Handbook of Positive Psychology* (pp. 89–105). Oxford: Oxford University Press.

Nakamura, J., & Csikszentmihalyi, M. (2009). Flow Theory and Research. In *The Oxford Handbook of Positive Psychology* (2nd ed.). Oxford: Oxford University Press.

Sarter, M., Givens, B., & Bruno, J. P. (2001). The cognitive neuroscience of sustained attention: Where top-down meets bottom-up. *Brain Research Reviews*, *35*(2), 146–160.

Schwartz, J. M., Stapp, H. P., & Beauregard, M. (2005). Quantum physics in neuroscience and psychology: A neurophysical model of mind–brain interaction. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *360*(1458), 1309–1327.

Shernoff, D. J., Csikszentmihalyi, M., Schneider, B., & Shernoff, E. S. (2014). Student engagement in high school classrooms from the perspective of flow theory. In *Applications of flow in human development and education* (pp. 475–494). London: Springer.

Szpunar, K. K., Moulton, S. T., & Schacter, D. L. (2013). Mind wandering and education: From the classroom to online learning. *Frontiers in Psychology*, *4*(Journal Article). https://doi.org/10.3389/fpsyg.2013.00495

Viadero, D. (2011). Student engagement; 'measuring student engagement in upper elementary through high school'. *Education Week*, *30*(18), 5.

Watson, A., Timperio, A., Brown, H., Best, K., & Hesketh, K. D. (2017). Effect of classroom-based physical activity interventions on academic and physical activity outcomes: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 114.

Wen, Z. (Edward), & Ahmadian, M. J. (2019). *Researching L2 Task Performance and Pedagogy: In honour of Peter Skehan*. Amsterdam: John Benjamins Publishing Company.

Wilson, K., & Korn, J. H. (2007). Attention During Lectures: Beyond Ten Minutes. *Teaching of Psychology*, *34*(2), 85–89. https://doi.org/10.1080/00986280701291291