COMMUNICATION VULNERABILITY IN THE DIGITAL AGE: A MISSED CONCERN IN CONSTRUCTIVISM

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ABSTRACT

The current wave of globalization aided by ubiquitous computing necessarily involves interaction and integration among people and human institutions worldwide. This has led to a worldwide awareness that professionals in academia need to have effective communication skills. Such communication-driven academic discourse puts much demand on language education, particularly tied to English as a medium of global communication. There is, however, a critical but unidentified gap. The targeted students are technically and academically capable but often with general communication difficulties, and such a student population is growing. This poses a challenge to constructivist classroom that is marked by student-centered, interactive, and group-oriented learning. This paper reports on exploratory studies on the temperamental, autistic tendencies of university students carried out in Japan and their preference in academic subjects including the English language. Results indicate that the university students are in general more toward drawing into themselves; that is, they are neither sociable nor communicative. The survey also shows a clear preference for less communication-driven subjects within their major, as opposed to study of the more communication-driven English language. These findings indicate the necessity of calling for complementary constructivism that would accommodate a student population with communication vulnerabilities. As far as English classroom is concerned, the relevance of adopting ESP (English for Specific Purposes) is clarified, which focuses on the knowledge structure of the subjects that find the students' strength. ESP is expected to compensate for their communication vulnerabilities, and thus to offer a hint for a meaningful form of complimentary constructivism for educational settings.

KEYWORDS

Complementary Constructivism, Communication Vulnerability, Science and Technology, ESP

1. INTRODUCTION

Though the emergence of the educational concept of constructivism has its roots in the Socratic dialogue, its evolution is relatively new. The paradigm change, from behaviorism to constructivism, arose in the 1950s in accordance with an increasing awareness of each child's natural inclination toward an autonomous, active learner. Among most influential constructivists are Piaget, Dewey, Vygotsky, and Bruner, to name only a few. As Table 1, taken from Educational Broadcasting Corporation (2004), shows, constructivist classroom focuses on communication-driven learning that is student-centered, interactive, dialogue-based, group learning. Noteworthy constructivists in relation to the digital age are Seymour Papert, John D. Bransford, and Roger Shank. They are all leading experts on integrating computer technology in teaching within the environment of constructivism where children are considered active learners; they learn by doing from experience.

There is, however, a missed concern that has never been pointed out explicitly till today, namely the growing student population with communication vulnerabilities. The students are technically and academically competent but they are neither sociable nor communicative, and yet there is a demand on them for good communication skills. Under the constructivism environment how should communication-driven language classroom deal with such a student population? The digital age seems to be calling for complementary constructivism that can accommodate students with communication difficulties.

Table 1. The Paradigm Shift in Classroom

	Traditional classroom	Constructivist classroom
1	Curriculum begins with the parts of the whole. Emphasizes basic skills.	Curriculum emphasizes big concepts, beginning with the whole and expanding to include the parts.
2	Strict adherence to fixed curriculum is highly valued.	Pursuit of student questions and interests is valued.
3	Materials are primarily textbooks and workbooks.	Materials include primary sources of material and manipulative materials
4	Learning is based on repetition.	Learning is interactive, building on what the student already knows.
5	Teachers disseminate information to students; students are recipients of knowledge.	Teachers have a dialogue with students, helping students construct their own knowledge.
6	Teacher's role is directive, rooted in authority.	Teacher's role is interactive, rooted in negotiation.
7	Assessment is through testing, correct answers.	Assessment includes student works, observations, and points of view, as well as tests. Process is as important as product.
8	Knowledge is seen as inert.	Knowledge is seen as dynamic, ever changing with our experience.
9	Students work primarily alone.	Students work primarily in groups.

While the field of language education gathers diverse case studies for 'know-how' types of practical outcomes, this paper is qualitative in nature with dual purposes. One is to raise an awareness of the critical gap which communication-driven constructivism faces with respect to the learners with communication difficulties. The other is to claim the necessity of calling for a model that would complement such constructivist classroom. This is done by reporting a quantitative exploratory survey conducted by the author on the students' temperamental (dispositional) tendencies associated with sociability and communicability and their preference for academic subject (i.e. subjects within their major versus the English language). Results clarify the relevance of ESP (English for Specific Purposes) which, by definition, uses learning materials specific to the learners' fields. Given the students' general communicative vulnerabilities, the results suggest that the communicative demands in tertiary education in general (and ESP classed in specific) be minimized. The paper thus concludes that a 'complementary constructivism' should be called for that would suit the digital age, although a new model is yet to come.

2. FACTS CHALLENGING CONSTRUCTIVISM

2.1 Communication Vulnerability in Communication-Driven Discourse

There has been a worldwide awareness that scientists and engineers need to have effective communication skills. A survey carried out in the USA, for example, reports that engineers and professionals in the field of technology spend half of their workplace hours on communication-related activities (Vest, Long, and Anderson, 1996). In line with this report is the result of another survey carried out in Australia, which shows that employers in computer science seek effective communication skills in graduates (Gruba and Al-Mahmood, 2004). Magno (2014) likewise reports on employers' similar demands for college graduates in Southeast Asia such as in the Philippines. Furthermore, JABEE (Japan Accreditation Board for Engineering Education), which was established in 1999 and became the first Asian nation member of the Washington Accord in 2005, emphasizes the importance of internationally endurable communication skills for engineers.

As specific academic discourse gets more and more communication-driven, the learner-needs appear to include skills that are associated with sociability and communicability. For example, Rose, Katada, Sheppard, and Manalo (2014) identify three basic areas of learner-needs:

(a) work collaboratively,

(b) communicate with industry and academic professionals, and

(c) write technical reports and documents.

Among the three, (a) and (b) are concerned with internal attributes of the learners and well suit the constructivist pedagogical design which focuses on communication-driven, interactive learning. It is evident that these attributes must be taken into account.

A challenge then arises because it is often the case that the targeted group of learners exhibits the opposite, autistic, attributes. They are often unsociable and not very communicative. It is noteworthy that such a population marked by communication difficulties or autistic traits keeps on growing. Many external factors may drive this increase, such as the growing awareness of autism, changes in diagnostic criteria, and more advanced screening tools (Wing and Potter, 2002; Cornwall, 2015). Yet, there is evidence that the prevalence of such a student population is rising.

2.2 Negative Connotations and Positive Overtones of Autistic Traits

The number of students who are academically capable or even gifted but who simultaneously have general communication difficulties is ever growing. This can be seen in the teachers' familiar comments: "the students are extremely shy and silent," "it's difficult to get them to talk," "I cannot communicate with them," "their culture is different from mine." Often, the students are beyond simple shyness; they are said to have autistic traits. *Digital teens* and *troublesome online youth groups* are the terms used by Bishop (2014) in educational settings, which refer to young people at the extreme end of the spectrum of sociability. Another expression used in this context is *digital natives*, which can be interpreted as an indication for the emergence of a new generation with communication vulnerability in digital age.

Every culture may find expressions for unsociable, non-communicative behaviors. *Geek* is a familiar English word; *otaku* and *asupe* are the closest common Japanese equivalents, both newly invented. While these expressions have negative connotations, Japanese culture brings positive overtones to some traditional expressions of these traits. Most specifically, *shokunin-katagi* 'artisan spirit' is a highly-valued characterization of skilled craftsmen who are often socially reticent, but with high tenacity and drive. The nation's vitality in global competence is often attributed to these traits.

It has been observed that professionals in science and technology have the tendency toward *geekish* or *artisanal* temperaments (dispositions). Baron-Cohen et al. (1998), for example, report that there is an association between science/math skills and autistic conditions, which is confirmed by their subsequent report on the autism-spectrum quotient (AQ) (Baron-Cohen et al., 2001). Silberman (2001) also suggests a link between the 'geek syndrome' and 'math-and-tech genes'.

The problem arises then because, as aforementioned, scientists and engineers are typical professionals who are required to have effective communication skills. As we will see in the next section, a student population with communication difficulties is no longer atypical in present-day academic communities. In order to cultivate effective curriculum development, educators must be aware of this ironical gap between communication-driven academic discourse and the learners' non-communicative dispositional nature.

2.3 The Prevalence on Campus

Unsociable, non-communicative temperaments and behaviors mark people with *developmental disorders*, which have come to be acknowledged only recently. Symptoms of developmental disorders are diverse, including ADHD (attention deficit hyperactivity disorder), HFA (high functioning autism), and AS (Asperger syndrome). With the new diagnostic standards of the *APA (*American Psychiatric Association) (1994) (see also WHO, 1990; 2007), developmental disorders have been subsumed under the label *ASD* (autism spectrum disorders), which is a continuum notion that ranges from the least to the highest degree of affectedness. Under the continuum interpretation, ASD is no longer perceived as a rare disorder.

Statistically, the prevalence of ASD keeps on increasing. In the USA 10% of the adult population may count as having ADHD alone (Hoshino, 2011). In California, the population affected by geek syndrome increased threefold during the 1990s and 85% of them are children (Silberman, 2001). As aforementioned, many factors are involved in this increase and an interpretation of the increase calls for careful attention (Honda et al., 2005). Nonetheless, a generally agreed view is that the affected population continues to grow.

For educational settings, the Ministry of Health, Labor and Welfare of Japan (2005-2006) reported that, out of 189 adults with ASD, two of them had graduate school degrees, 50 were four-year college graduates, and 16 were two-year junior college graduates. This totals nearly 40% of the affected individuals who had received a college education. Moreover, 117 of them (that is, over 60%) spent their entire school-lives in regular classes, not in classes with special needs. This indicates that the student population with ASD is large enough on regular campuses. I anticipate that such a situation is a worldwide reality.

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Three areas of affected behavior typical of ASD are: (a) sociability, (b) communication, and (c) imagination (flexible thinking), which in this paper are subsumed under a single term 'communication vulnerability'. In constructivist classrooms, the students' communication vulnerability should be acknowledged as a voice for a new type of learner-needs.

3. EXPLORATORY SURVEY ON TEMPERATMENTAL TENDENCIES OF UNIVERSITY STUDENTS

Based on the established necessity of understanding learners' internal attributes in educational settings, I conducted an exploratory survey on temperamental tendencies and academic attitudes and behaviors, with special attention paid to one group of the target learners, namely students in science and technology. This section reports on part of the survey relevant to the issues raised in this paper.

3.1 Structure and Form of the Survey

The survey was conducted in the form of questionnaire consisting of Part I and Part II with three main purposes (1) – (3) stated below.[1] Part I, consisting of two categories (a) and (b), is directly linked to purpose (1); it is then expected to lead to achieving purpose (2). Part II, consisting of five categories (c) – (g), is linked to purpose (3); it is designed to see if the students' temperamental tendencies appear to pattern with their other academic behaviors. Subjects were two groups of undergraduate students: Group (1) consisting of science and technology majors (S&T) and Group (2) consisting of various other majors (Mixed).

<Part I>
category (a) 50 questions to measure the autism-spectrum quotient (AQ) (Baron-Cohen, at al., 2001)
category (b) 10 questions about the students' preference for academic subjects

<Part II>
category (c) 5 questions about critical thinking, taken from MSLQ (motivated strategies for learning questionnaire) (Pintrich and De Groot, 1990)
category (d) 9 questions from the self-efficacy section of MSLQ (Pintrich and De Groot, 1990)
category (e) 18 questions to measure Asian students' cognitive attitudes (Stapleton, 2002)
category (f) 8 questions out of 33 to major effects of critical thinking attitudes to decision making processes (Hirayama and Kusumi, 2004)
category (g) 24 questions on two types of self-control (Kruglanski, et al., 2000)

<Purposes>
(1) Capture temperamental tendencies of the undergraduate students and their preference in academic subjects including the subjects of their major and the English language.
(2) Construct an effective curriculum that fills in the gap between communication skills development and the students' characteristics associated with communication vulnerabilities.
(3) Examine whether the students' temperamental tendency is correlated with their other academic attitudes such as critical thinking, self-efficacy, etc.

<Subjects>
Group (1): 250 undergraduate students of science and technology (S&T Group)
Group (2): 200 undergraduate students of various majors (Mixed Group)

This paper limits itself to Part I only, given that the theme underlying Part II is beyond the scope of this paper.

[1] The survey has been expanded and conducted in developing countries such as in the Philippines (2015-2016), where linguistic backgrounds are far more complicated in both their mother-tongues and languages of education. Results have many implications for thought and language, nations' vitality, and most especially where English is situated. In my estimation, these issues are quite important when deploying language policy in education for the coming century. However, they are beyond the scope of the main concerns of this paper, and I leave relevant discussion to another opportunity of presentation.

3.2 Background for Part I

Baron-Cohen et al. (2001) constructed 50 questions in English as a self-administered instrument to assess the degree to which an adult with normal intelligence has traits associated with the autistic spectrum. This English version was transformed into a Japanese version by Wakabayashi et al. (2004). Both versions have been standardized with AQ (the autism-spectrum quotient) ranging from 1 to 50.

The AQ score of higher than 32 (≥ 33) is a useful cut-off point for distinguishing individuals with clinically significant levels of autistic traits. This is based on the research results that, while 80% of adults with AS (Asperger syndrome) and HFA (high functioning autism) scored above 32 on the AQ scale, only 2% of the controls did so. In the same manner of standardizing, 26 is the score that can be interpreted as a cut-off point for no autistic traits. That the subject population with AS/HFA scored significantly higher than the controls in their surveys is shown in two distinct, maximally separated curves in Figure 1 in the following section3.3.1. The rightmost curve is for the population with AS/HFA and the leftmost is for the controls.

In the present report, category (a) of Part I consists of 50 questions adopted from the Japanese version to assess university students' autistic traits. It was expected that Group (1) students of science and technology (S&T) will show a higher degree of autistic traits than Group 2 students of various majors (Mixed).

Category (b) consists of 10 questions asking for the students' preferences for academic subjects including English. This is to probe where in academic domains the students' strength lie not only technically but also emotionally. It was expected that results will suggest pedagogical directions for curriculum design, especially in reference to communication-driven language subjects such as English and less-communication driven, knowledge-centered subjects such as mathematics, physics and chemistry.

3.3 Results and Analyses

3.3.1 Part I: Category (a)

The result in category (a) of the exploratory survey is shown in Table 2, which is overwritten in Figure 1 so that it can be easily seen in reference to the standardized interpretation of autistic traits explained above in section 3.2.

Table 2. AQ score ranges

Group	< 26	26 ≤	30 ≤	33 ≤	Total
(1) S&T	174 (69.6%)	76 (30.4%)	32 (12.8%)	18 (7.2%)	250 (100%)
(2) Mixed	109 (54.5%)	91 (45.5%)	41 (20.5%)	13 (6.5%)	200 (100%)

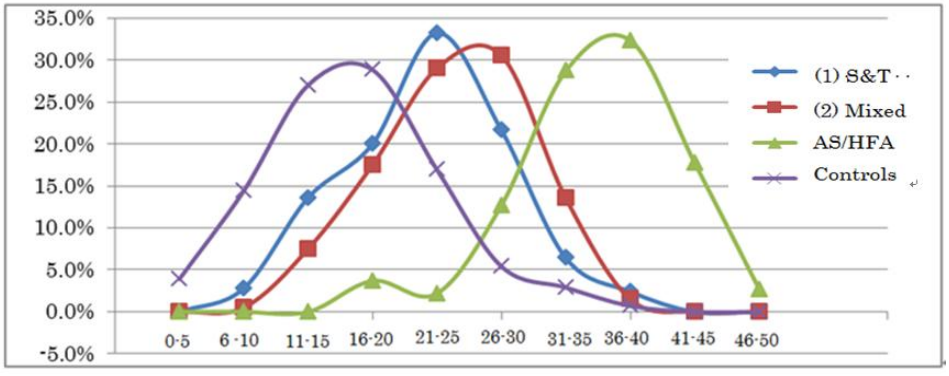

Figure 1. AQ scores in reference to the standardized interpretation

As Table 2 shows, those who scored higher than 32 (≥ 33) on the AQ scale appeared as: [S&T : Mixed] = [7.2% : 6.5%]. This indicates that there is no significant difference in clinically significant levels of autistic traits between the two groups. These percentages, however, are significantly higher than 2%, the corresponding standardized figure for the controls. Also noted in Figure 1 is that, in all score ranges up to 36-40, Group (2) (Mixed majors) scored slightly higher than Group (1) (Science & Technology majors). This is contrary to our expectation.

Figure 1 also shows that both of the two student groups fall between the controlled adults and the AS/HFA-diagnosed adults. This indicates that the students tend to draw into themselves more than the controlled adults do. This might be due to the youth-specific autistic tendency, which is consistent with the observation reported by previous studies (Baron-Cohen et al., 2001 and Wakabayashi et al., 2004). For the purpose of this paper, it is appropriate to interpret that the university students in general, regardless of their majors, are not particularly communicative. Such temperamental tendency is not in harmony with communication-driven constructivist classroom and must be taken into account when pedagogical designing takes place.

3.3.2 Part I: Category (b)

Unlike the results in category (a), the two groups appeared to exhibit a clear contrast in category (b) their preference for academic subjects. To the extent that is relevant in this paper, the results restricted to English, physics/chemistry, and mathematics are shown in Table 3.

Table 3. Preference for Academic Subjects

Group		English	Physics/Chemistry	Mathematics
(1) S&T	favored (+like)	87 (34.8%)	176 (70.4%)	171 (68.4%)
	unfavored (−like)	163 (65.2%)	74 (29.6%)	79 (31.6%)
	HT	0	60.96	50.06
(2) Mixed	favored (+like)	81 (40.5%)	73 (36.5%)	99 (49.5%)
	unfavored (−like)	119 (59.5%)	127 (63.5%)	101 (50.5%)
	HT	0	0.52	2.92

In Group (1) (science & technology majors), less than 35% of the students named English as their favorite subject, whereas over 65% responded that English is not a subject they favor or like. The majority of the students in science and technology appeared to feel that English is a hard subject to deal with. Noteworthy is a turnabout effect between English and hard science subjects. That is, the ratio of [35% (+like) vs. 65% (−like)] for English gets reversed into [70% (+like) vs. 30% (−like)] for physics/chemistry and mathematics. Under the null hypothesis that there is 'no difference with respect to English', this turnabout is salient enough going beyond the usual hypothetical range, as shown by extremely high HT (hypothesis testing) values: about 61 for physics/chemistry and 50 for mathematics.

One may say that this is not a surprise since the students are of science and technology major whose strength should lie in hard science subjects. Such rather unsurprising result, however, is a significant message for constructivist classroom for at least this targeted group of students.[2] This is discussed in the next section 3.4.

By contrast, the reversal phenomenon did not appear in Group (2) (mixed majors). In Table 3, the ratio of [(+like) vs. (−like)] goes from [40.5% vs. 59.5%] for English to [36.5% vs. 63.5%] for physics/chemistry to [49.5% vs. 50.5%] for mathematics. As HT values lower than 3.0 (critical value) for these hard science subjects show, the null hypothesis holds here; that is, for students of mixed majors there is no significant difference in the their preference between English and the hard science subjects.[3]

[2] It may not be so unsurprising as we think when cross-cultural data come into play. In fact, the survey carried out in the Philippines did not show such a drastic contrast between English and the hard science subjects in the group of students with similar science majors. Many complicated factors interplay to yield contrastive results between the two distinct cultures, and these themes are under careful inspections, and I leave extended discussion on comparative studies to another opportunity of presentation.

[3] Given the main issue of this paper being hard science majors, I leave detailed discussion on mixed majors to another opportunity of presentation.

3.4 Implications for Complementary Constructivism and ESP

The autistic traits measured by AQ did not appear to be tangibly attributable to science and technology majors. However, compared to the standardized controls, a significant number of the students, regardless of their majors, attained high scores on the AQ scale. In other words, it is general tendency that the university students draw into themselves; that is, they are neither sociable nor communicative. The survey appeared to show that such temperamental (dispositional) tendency associated with communication vulnerabilities is an issue relevant to tertiary education in general and must be taken into account for pedagogical designing.

In ordinary English language classroom, students of science and technology come to face double challenges; they are by nature neither communicative nor fond of English, even though English is the medium of global communication in the digital age and they need it. Supplementing these disadvantages, however, they have an advantage; that is, they are strong in hard science subjects.

Implications for constructivist language classroom seem to be clear. First of all, English language education (ELE) in tertiary education should be ESP (English for Specific Purposes), which by definition focuses on materials in the academic domains where targeted students' strength lies. ESP classroom for science and technology majors naturally uses materials from basic mathematics and physics/chemistry since these are the subjects that find the students' strength. The conceptual knowledge of these subjects functions as a cushion to reduce uncomfortable feelings or fears that the majority of the science students have towards communication-driven English classroom. The knowledge of hard science materials can be expected to compensate for the weakness they feel towards communication.

Second, autistic traits are most of the time beyond the individual's control. Thus, even though ESP is ultimately communication-oriented, it should not be unreasonable pedagogically if the demand on the students for sociability and communicability is minimized. ESP should rather concentrate on the universal knowledge of academic subjects in their major because understanding and explaining structured knowledge of the specialized fields do not require extensive human interaction, which is the learners' weak area. Less demanding human communication activities would hopefully function as an incentive to improve the learners' general communicative competence, which certainly is an essential ability for survival.

Finally, as pointed out by a reviewer, another medium of communication mediated by computers is on the rise. It is reported by McDowell (2015) that, through computer-mediated communications, learners diagnosed as having Asperger syndrome have opportunities for meaningful participation in group-work. Ironically, such a communication form and a generation with communication vulnerability are both the 'products' of digital age that are in harmony with each other. ESP and computer-mediated communication together may offer a hint to develop a meaningful form of complementary constructivism in education.

4. CONCLUSION

The emphasis of the field of language education has been on practical outcomes. This paper, by contrast, is qualitative in nature backed up by quantitative exploratory survey results. It demonstrated that there is a new type of concern, communication vulnerability in university students, which poses a challenge to communication-oriented constructivist classroom. Complementary constructivism must therefore be called for. Focusing on students of hard science majors and their communicative needs, the paper has shown that ESP (English for Specific Purposes) can be a solution. Although practical models are yet to come, ESP, together with some form of computer-mediated communication, is worth exploring for the development of potential models of complementally constructivist classroom in the digital age.

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REFERENCES

American Psychiatric Association: APA, 1994. *Diagnostic and Statistical Manual of Mental Disorders-IV: DSM-IV*.

Baron-Cohen, S., Bolton, P., Wheelwright, S., Short, L., Mead, G., Smith, A., and Scahill, V., 1998. Autism Occurs More Often in Families of Physics, Engineers, and Mathematics. In *Autism*, Vol. 2, pp 296-301.

Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., and Clubley, E., 2001. The Autism-Spectrum Quotient (AQ): Evidence from Asperger Syndrome/High-Functioning Autism, Males and Females, Scientists and Mathematicians. In *Journal of Autism and Developmental Disorders*, Vol. 31, pp 5-17.

Bishop, J., 2014. Digital Teens and the 'Antisocial Network': Prevalence of Troublesome Online Youth Groups and Internet Trolling in Great Britain. In *International Journal of E-Politics*, Vol. 5, No. 3, pp 1-15.

Cornwall, W., 2015. Autism Rates Are Up, but Is It Really on the rise? In *Health*. DOI: 10.1126/science.aaac8889.

Educational Broadcasting Corporation, 2004. Concept to Classroom: How does This Theory Differ from Traditional Ideas about Teaching and Learning? Retrieved from http://www.thirteen.org/edonline/concept2class/constructivism/index_sub1.html on 19 June, 2016.

Gruba, P. and Al-Mahmood, R., 2004. Strategies for Communication Skills Development. In *Proceedings of the Sixth Australasian Conference on Computing Education*, Vol. 30, pp 101-107.

Honda, H., Shimizu, Y., Imai, M., and Nitto, Y., 2005. Cumulative Incidence of Childhood Autism: A Total Population Study of Better Accuracy and Precision. In *Developmental Medicine and Child Neurology*, Vol. 47, No. 1, pp 10-18.

Hirayama, R. and Kusumi, T., 2004. Effects of Critical Thinking Attitudes to Decision Making Processes. In *Studies on Educational Psychology*, Vol. 52, pp 186-198. (written in Japanese)

Hoshino, Y., 2011. *Adults Who do not Recognize Developmental Disorders: Volume for Workplace*, Tokyo: Shodensha Shinsho. (written in Japanese)

Kruglanski, A.E., Thompson, E.P., Higgins, E.T., Atash, M.N., Pierro, A., and Shah, J.Y., 2000. To "Do the Right Thing" or To "Just Do It": Locomotion and Assessment as Distinct Self-Regulatory Imperatives. In *Journal of Personality and Social Psychology*, Vol. 79, No. 5, pp 793-815.

Magno, J., 2014. Needed Skills in the Workplace: A Survey of Employers' Perceptions of the Linguistics and Literature Majors. Paper presented at International Conference on Applied Linguistics and Language Education 2014. De La Salle University, Manila, Philippines. October 16-18, 2014.

McDowell, J., 2015. "A Black Swan in a Sea of White Noise: Using Technology-Enhanced Learning to Afford Educational Inclusivity for Learners with Asperger's Syndrome. In *Social Inclusion*, Vol. 3 No. 6, pp 7-15. DOI: 10.17645/si.v3i6.428.

Pintrich, R.R. and DeGroot, E.V., 1990. Motivational and Self-regulated Learning Components of Classroom Academic Performance, In *Journal of Educational Psychology*, Vol. 82, pp 33-40.

Rose, R., Katada, F., Sheppard, C., and Manalo, E., 2014. Addressing Challenges in a Large-scale ELT Program: Learner Needs, Teaching Approaches, and Learner Assessment. In *AILA World Congress 2014 Abstract Book*, p 50.

Silberman, S., 2001. The Geek Syndrome: Autism - and Its Milder Cousin Asperger's Syndrome - is Surging among the Children of Silicon Valley. Are Math-and-Tech Genes to Blame?, *Wired* 9.12, December 2001.

Stapleton, P., 2002. Critical Thinking in Japanese L2 Writing: Rethinking Tired Constructs, *ELT Journal* Vol. 56, No. 3, pp 250-257.

Vest, D., Long, M., and Anderson, T., 1966. Electrical Engineers' Perceptions of Communication Training and Their Recommendations for Curricular Change: Results of a National Survey. In *IEEE Transactional Communication*, Vol. 39, No. 1, pp 38-42.

Wakabayashi, A., Tojo, Y., Baron-Cohen, S., and Wheelwright, S., 2004. The Autism-Spectrum Quotient (AQ) Japanese Version: Evidence from High-Functioning Clinical Group and Normal Adults. In *The Japanese Journal of Psychology*, Vol. 75, No. 1, pp 78-84. (written in Japanese)

Wing, L. and Potter, D., 2002. The Apidemiology of Autistic Spectrum Disorders: Is the Prevalence Rising? In *Ment. Retard. Dev. Disabil. Res. Rev.*, Vol. 8, pp 151-161. DOI: 10.1002/mrdd.10029.

World Health Organization: WHO, 1990/2007. *Statistical Classification of Diseases and Related Health Problems-10: ICD-10*, International Statistical Institute: ISI.