

# INITIATING AND INSTITUTIONALIZING COGNITIVE SCIENCE AND PSYCHOLINGUISTICS IN NEPAL: A REPORT

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## 1. Introduction

Cognitive Science, even though it's a well-established discipline in the western countries and emerging economies like our close neighbours China and India, is still an uninitiated discipline of study in Nepal. Psycholinguistics is slowly taking roots. There is absolute lack of human resource and technical expertise to lead and further this field in the country. Despite its massive potentials for future in terms of what it can unravel in understanding human cognitive mechanisms and contribute in the field of education, linguistics, anthropology, psychology, computer science, mathematics, mental and neurological health, science and technology, business and management, the discipline remains rather unknown to the leaders in academia in Nepal. This report provides a peep into the efforts being undertaken to advance this field in Nepal, its potentials and what needs to be done.

## 2. Cognitive Science and Psycholinguistics initiatives in Nepali academia

Currently, Cognitive Science and Psycholinguistics is not yet introduced in Nepali academia except for some components of Psycholinguistics being taught at the Central Department of Linguistics and Department of English Education in Tribhuvan University. An initiative is being taken at the Central Department of Linguistics by this researcher to establish Cognitive Science and Psycholinguistics Lab to train the students with the methods, tools and techniques of doing research in this field and to explore more possibilities in this field.

In the past, there have been some sporadic works in this field, although on individual basis rather than in organized and institutional manner. A longitudinal case study on Nepali Child Language Acquisition with qualitative data spanning the age of 6 months to four and half years has been conducted by Pathak (2004; 2005; 2007). Prof. Jubin Abutalebi, a leading researcher and scientist in bilingualism and multilingualism and its impact on the human brain visited Nepal and gave a talk in the Central Department of Linguistics in October 2016.

## 3. Establishment of Cognitive Science and Psycholinguistics Lab in Nepal at Tribhuvan University and its output

Lekhnath Sharma Pathak, a faculty member in the Central Department of Linguistics took the initiative of pursuing PhD in Cognitive Science at the Center for Neural and Cognitive Sciences, School of Medical Sciences in Central University Hyderabad, India. This was the

first such initiative from Nepal (who was also partially supported by University Grants Commission, Nepal). During the course of his PhD work he worked and presented on Gurung-Nepali parallel language activation (Pathak & Mishra 2016) and Nepali- English immersion bilingual study (Pathak & Mishra 2016), and presented his work using mouse tracking in an international scientific conference (Freeman & Ambady 2010; Pathak 2017). Upon his return from PhD work, he initiated the establishment of Cognitive Science and Psycholinguistics Lab in the Central Department of Linguistics and was permitted to do so by the department with a space at its library, which took a formal and official shape when the Central Department of Linguistics officially set up the Cognitive Science and Psycholinguistics Lab by a departmental decision and made him the Faculty-in-Charge and Principal Investigator of this lab on February 7, 2021. A paper titled “Bilingual Stroop Effect on High and Low Proficient Nepali – English Bilinguals” was presented in the 39<sup>th</sup> Annual Conference of Linguistic Society of Nepal on November 26 – 27, 2018 (Pathak & Pathak 2018). This was the first study from this lab by an intern who learned the method and made an academic presentation. The first research work that started in this lab was a multi-lab collaborative work on spatial cognition testing on demonstrative use across 29 languages spoken in different parts of the world led by Prof. Kenny Coventry, School of Psychology, University of East Anglia, UK and collaborated by Cognitive Science and Psycholinguistics labs across US, Europe, Asia and Africa. The lab contributed to the testing of demonstrative processing in Nepali language (Coventry et al, under review). This researcher presented a talk entitled “Parallel language activation and cognitive control in bilinguals” in the 2<sup>nd</sup> Annual conference of Applied Linguistics and ELT organized by Department of English Education, Tribhuvan University on 9 – 11 February, 2019 (Pathak 2019). This researcher gave an invited talk on “Possibility of Cognitive Science in Nepal” on March 22, 2019 organized by Nepal Norway Alumni Association in Hydro Lab Seminar Hall in Lalitpur (Pathak, 2019) and discussed various aspects and significance of starting Cognitive Science in Nepal. This researcher was invited to give a Plenary Session on the theme “Science of Learning: Approaches from Cognitive Science” to the Joint School Teachers’ Workshop (of 6 leading schools of Kathmandu, attended by 500 teachers) organized by Kathmandu University High School at St. Xavier’s School, Jawalakhel, Lalitpur, Nepal on May 25, 2019 (Pathak 2019). Recognizing the work done by this researcher in Nepal, he was invited to deliver a Keynote Speech entitled “Situation of Illiterates in Nepal: What does it mean for Cognitive Science?” at the 3<sup>rd</sup> International Workshop of Society for Cognitive Science of Culture at Birla Institute of Technology and Science University, Pillani Campus, Goa, February 3 – 7, 2020 (Pathak 2020). A poster was presented on “Bilingual Literacy Effect on Executive Control” from an ongoing work in the lab by Sabita Rijal and Lekhnath Sharma Pathak at the 3<sup>rd</sup> International Workshop of Society for Cognitive Science of Culture at Birla Institute of Technology and Science University, Pillani Campus, Goa, February 3 – 7, 2020 (Rijal & Pathak 2020).

First Psycholinguistics MA thesis with the title “Effect of first and second language mediated instruction on cognitive control: A psycholinguistic study” by Sabita Rijal was submitted at the Central Department of Linguistics in 2020 which was a product of the Cognitive Science and Psycholinguistics Lab (Rijal 2020). This study compared two

government schools of Kathmandu Valley that used either first language (Nepali) or second language (English) as medium of instruction and measured language comprehension, language production and cognitive control tasks. Language comprehension task was measured using LexTale (Lemhofer & Broersma 2012), language production task was measured using verbal fluency task (Golan & Montoya 2002). Cognitive control was measured using Stroop (Stroop, 1935) and Flanker (Poarch & van Hell 2012) tasks in a mouse tracking paradigm. This study showed that the children who were instructed in L2 performed much better than the children who were taught in L1 instruction in all the measures. Children receiving instruction in L2 performed better even in L1 production tasks compared to the children receiving instruction in L1.

Another study investigating the second language literacy effect on the written and spoken word processing in Lohorung – Nepali bilinguals is in progress (Pathak, Rai & Pathak, in preparation).

Recently, the lab has started investigating a case of L1 attrition and reacquisition on an individual who was adopted at the age of seven from Nepal by an American family, was fluently in Nepali L1 but lost the language completely by age eleven and switched over to English as L1 gradually forgetting previous L1 Nepali completely and has started relearning in the mid-twenties.

#### 4. First International Webinar on Cognitive Science and Psycholinguistics

The founder of this lab is also an alumnus of Norwegian University of Science and Technology (NTNU). As part of collaborative initiative with NTNU, this lab organized its first international webinar in association with NTNU Alumni Nepal and in collaboration with Cognitive Science and Psycholinguistics Lab, Tribhuvan University (TU), Nepal and Language Acquisition and Processing Lab, Norwegian University of Science and Technology (NTNU), Norway on 26 February 2021. It disseminated the works going on in this area at Language Acquisition and Processing Lab, NTNU directed by Prof. Mila Vulchanova and the initiatives being taken in Nepal and the current state of affairs and future prospects and possibilities. This webinar opened up avenues for research and collaboration in the field of Cognitive Science and Psycholinguistics among the interested researchers and create an awareness among the general audience. The theme of the webinar was “Cognitive Science and Psycholinguistics for understanding human mind, brain and cognition: Prospects and Possibilities”. The program was moderated by Prof. Ajay Risal, Head, Department of Psychiatry, School of Medical Sciences, Kathmandu University and Dr. Biraj Singh Thapa, Associate Professor and Team Leader, Green Hydrogen Lab, Department of Mechanical Engineering, Kathmandu University.

A brief introduction of the presenters and their presentation:

Mila Vulchanova is Professor at the Department of Language & Literature, and the Director of the Language Acquisition and Language Processing Lab, Norwegian University of Science & Technology, Trondheim. She is also the Scientific Director of the Norwegian National Graduate School of Linguistics. Her area of expertise includes language development, developmental deficits, language and cognition, advanced experimental

research in language, spatial cognition and language, bilingualism, lexical semantics, language diachrony, the syntax of nominal expressions and language typology. She has secured numerous national and international large-scale grants, among which 7 FP *LanPercept Marie Skłodowska-Curie ITN* (2012-2016) as Coordinator, the Norwegian Research Council FRIHUM project “Situating reference in Language Acquisition” (2012-2016), WP-lead for Horizon2020 Marie Skłodowska-Curie ITN *DCOMM* (2016-2020), MC member and training coordinator of *COST Action IS1406* “Enhancing children's oral language skills across Europe and beyond - a collaboration focusing on interventions for children with difficulties learning their first language” (2015-2019), and the NRC Norwegian National Graduate School of Linguistics (2012-2021). She is currently the coordinator of the Horizon2020 MSCA ITN *e-LADDA* (2019-2024), and WP leader of the Horizon2020 MSCA ITN *SellSTEM*.

Valentin Vulchanov is Senior Researcher at the Department of Language & Literature and one of the founders of the Language Acquisition and Language Processing Lab, Norwegian University of Science & Technology, Trondheim. His expertise spans language and cognition, language in developmental deficits, and language diachrony, the syntax of nominal expressions. He has been PI in a number of large-scale EU and National Norwegian and international research projects, such as Horizon2020 MSCA ITN *e-LADDA* (2019-2024), Horizon2020 MSCA ITN *SellSTEM* (2021-2025), MSCA ITN *DCOMM* (2016-2020), 7th FP MSCA ITN *LanPercept* (2012-2016), Erasmus+ "Development of Online Learning Environment for e-Health" *DOOLEE*, among others.

Mila Vulchanova and Valentin Vulchanov presented on “What pointing gestures can tell us about early communication development”. Drawing upon the research conducted in the Language Acquisition and Language Processing Lab, they presented on the language and gesture interface mainly in the early developmental stages. Their study showed that a greater paradox exists in individuals with autism spectrum disorder where they face problems in figurative language and advanced syntax processing even if they are linguistically talented (Vulchanova et al, 2012) compared to the paradox of problems with pragmatic skills and complex syntax across the spectrum even when structural language remains intact (Landa, 200; Tager-Flusberg et al, 2005). They presented their results of a comparison of figurative language comprehension between individuals with and without autism disorder (Chahboun et al, 2016), a critical review of clinical and experimental research in problems of figurative language processing in atypical population with focus on autism spectrum disorder (Vulchanova et al, 2015), metaphorical priming in high functioning autism (Chahboun et al, 2017), language processing differences in typically growing individuals and those with ASD using both eye-tracking and mouse-tracking (Vulchanova et al, 2019), difficulties experienced by autistic individuals in language and communication using priming paradigm in lexical decision task (Chahboun et al, 2015), exploring current theories of figurative language processing and acquisition in literal or compositional meaning in interpreting non-literal expressions (Vulchanova et al, 2019), acquisition of multiword acquisition in children L1 and adult L2 (Milburn et al, 2021). They provided evidence from research on gesture in ASD, drawing in quantitative and qualitative differences focusing on a novel approach to gesture morphology (Ramos-Cabo

et al. 2019) showing children with ASD produce few pointing gestures, fewer index finger, fewer no contact pointing gesture compared to typically developing children.

At the end of their presentation, Prof. Vulchanova gave an online guided tour of the Language Acquisition and Language Processing Lab at the Department of Language and Literature in NTNU.

Evelyn Arko Milburn is Postdoctoral Fellow at Language Acquisition and Language Processing Lab at the Department of Language and Literature in NTNU. As a psycholinguist, her research is driven by one basic question: "During language comprehension, where does meaning come from?" She uses eyetracking and behavioral methods to investigate this question in several areas of sentence processing. In particular, she is interested in figurative language comprehension, particularly idioms. One of her current projects involves exploring how idiom-internal characteristics interact with linguistic context to drive meaning access during idiom comprehension. However, she is also interested in how extra-linguistic semantic information--such as gesture and world knowledge--interact with language. Her research involves a wide range of participants, from college-age students to healthy older adults to people with aphasia, and she has recently expanded into second-language processing as well.

Evelyn Arko Milburn presented on "Holding Keys and Playing With Fire: An Ongoing Exploration of Idiom Comprehension". She discussed how multiword formulaic expressions like "fish and chips", "don't worry about it" aid fluency and speed processing by reducing load on working memory which comes naturally to native speakers but is difficult to acquire for adult L2 learners. In contrast to native speakers, adult L2 learners struggle with figurative and idiomatic expressions (Milburn & Warren 2019). Against this backdrop of language acquisition, she presented her current study investigating whether native and non-native speakers of English rely on different strategies like word by word processing versus whole phrase retrieval while retrieving and producing idioms using visual world paradigm in which participants look at the pictures and hear sentences while their eyes are tracked as they click on the picture that best completes the sentence, in which sentences could be completed literally or figuratively, but the most appropriate completion was biased by the context. Her results based on growth curve analysis provided evidence that native and non-native speakers rely on different units during comprehension. As people gain more experience with language, their ability to pick up on hidden meanings and nuances also develops changing trajectory of reliance on compositional processing, holistic retrieval, and contextual support. She suggested parents and educators can use their research to help learners from all backgrounds build skill with figurative language.

Lekhnath Sharma Pathak is Assistant Professor (Lecturer) in the Central Department of Linguistics, Tribhuvan University, Nepal. He is the founder of Cognitive Science and Psycholinguistics Lab at the department in which he is the Faculty-in-Charge and Principal Investigator. He uses mainly MouseTracker to investigate the dynamics of human cognitive processing modulated by bilingualism, multilingualism, literacy and culture. He is a Founding Member of Society for Cognitive Science of Culture. He has collaborated in DCOMM project and contributed to spatial cognition. He was invited as a Keynote Speaker

in the 3<sup>rd</sup> International Workshop of Society for Cognitive Science of Culture at BITS Pilani, Goa in 2020. He is a Secretary and Board Member of NTNU Alumni Nepal chapter.

Lekhnath Sharma Pathak presented on “Prospects and Possibilities of Cognitive Science and Psycholinguistics in Nepal”. He started with a brief introduction to the field of cognitive science and psycholinguistics, methods and tools used to investigate human brain and cognition and its mechanisms. Introducing the field in Nepal, he informed that empirical, scientific, experimental research in the area of Cognitive Science and Psycholinguistics in Nepal began with the starting of Cognitive Science and Psycholinguistics at the Central Department of Linguistics by him in early 2019, which took a formal and official shape when the Central Department of Linguistics officially set up the Cognitive Science and Psycholinguistics Lab by a departmental decision and made him the Faculty-in-Charge and Principal Investigator of this lab on February 7, 2021. Giving a brief sketch of psycholinguistics in Nepal, he introduced MouseTracker, the main tool used in the lab to conduct experiments and collect data. He mentioned of the projects accomplished by the lab which includes an MA thesis by Ms. Sabita Rijal under his supervision, which is also the first empirical and experimental master’s thesis work in psycholinguistics (Rijal 2020). He also mentioned of a mini-research on *Parallel language activation in Nepali-English-Sanskrit: A Mousetracking Psycholinguistics study*. submitted to the Research Directorate, Rector’s Office, Tribhuvan University, Kirtipur, Kathmandu, Nepal (Mini Research Grant No. 68/076-7-8) (Pathak 2020). He also mentioned of the national and international presentations given on the works of the lab and international collaboration and an ongoing work on trilingual processing of Nepali-English-Norwegian in collaboration with NTNU which has been submitted for publication (Pathak et al, under review), including the ongoing research in the lab on Gurung-Nepali bilingual study, Magar-Nepali-English trilingual study. He concluded with the possibilities that the field of cognitive science and psycholinguistics holds in Nepal that Nepal is still a virgin land for Cognitive Science with tremendous potentials (like our waters!). He mentioned of the fields that can be investigated using the tools, techniques and methods of cognitive science in education: Early education to various stages, Mother Tongue Education, Multilingual Education, AI, Robotics, Computer Science, Psychology, Linguistics, Anthropology, Economics, Management; Language: How language shapes our cognition, Speech Language Pathology; Business: What are the consumer behavior and product perception; Health: Mental health, dementia, Autism, dyslexia; Culture: Culture and its influence on our cognition; Ethnicity: Is there ethnic variation in cognition? How do various ethnic groups perceive each other? Forensics: Cognitive Science tools and techniques are effective in lie detection.

Present Head of the Department, Prof. Balaram Prasain and former Head and present Assistant Dean, School of Humanities and Social Sciences, Prof. Dubi Nanda Dhakal spoke of their appreciation on the establishment of the lab and their all support to the lab. Royal Norwegian Embassy representative Mr. Jan-Erik Studsrød, Counsellor/Energy and Climate expressed his happiness on the organization of this webinar in collaboration with NTNU.

5. What we can offer: Expertise and tools

Currently, Cognitive Science and Psycholinguistics Lab is housed in a modest space provided by the Central Department of Linguistics in its departmental library in the university premises in Kirtipur. The lab is also associated with Research Management Cell (RMC) set up in the department with the help of University Grants Commission, Nepal. We have started doing some impactful work and have started publishing in peer-reviewed impact factor scientific international journals. At present, we are using MouseTracker as our main tool for investigating cognitive and psycholinguistic processing mechanisms (for studies published from our lab using this tool, see Pathak et al. 2021; Pathak & Pathak 2022; Pathak et al. under review). We have developed reasonable expertise in statistical analysis using SPSS and R as statistical analysis softwares. We have undergraduate students doing internship in our lab and master's students involved in various research projects as part of their training. We are open to collaboration and offer our expertise on what we have acquired so far.

## 6. Future Direction

Setting up a research lab and keeping it functional is an arduous task and requires massive financial and technical resources besides the passion and dedication of the PI, which the PI cannot alone manage and needs support from the university and other state machineries. Our vision is to make it a world class scientific lab in the field of cognitive science and psycholinguistics and contribute in nation building by touching upon various aspects human involvement and engagement and factors that can contribute to knowing human mind and brain better. We would like to extend technical lab facilities like eye-tracking, skin conductance and EEG/ERP in future, provided resources are made available to the lab. We would also like to extend more behavioural research designing softwares and introduce more advanced statistical programming and analysis know-how for doing and publishing cutting-edge research from Nepal.

Our plan is to introduce academic programs at undergraduate and graduate level to train more human resources and establish the field in Nepal to stay at par with the international scientific community researching and publishing in this field and to exchange and extend our network and collaborations nationally and internationally. We envision to have our own fully functional academic program with our own independent set up.

## 7. Conclusion

Nepal is all waiting to unfold itself through the research in cognitive science and psycholinguistics. Nepal provides a richness in culture, ethnicity, linguistic diversity, religious practices, folk beliefs, professional and occupational diversity, ecological and climatic variations that may affect cognition. How such contexts of diversities may affect cognitive mechanisms like perception, memory, attention, language processing. Many neuropsychological conditions like autism, dyslexia, dementia are showing up in abundance but there is no empirical body of research that can inform interventional or therapeutic measures in our own conditions. With human resources equipped with the science and technology of this field can contribute immensely in the field of education, business and management, health and medical sciences, forensics, speech and language

related disorders. It will be in the interest of the academic institutions of higher education, government and state mechanisms to pursue and promote this field in Nepal.

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### Appendix: Program Schedule of the International Webinar

#### Talk Series (NTNU Sustainability): Episode 2

Organized by NTNU Alumni Nepal in collaboration with Cognitive Science and Psycholinguistics Lab, Central Department of Linguistics, Tribhuvan University (TU), Kathmandu, Nepal and Language Acquisition and Language Processing Lab, Department of Language and Literature, Norwegian University of Science and Technology (NTNU), Norway.

Webinar on: Cognitive Science and Psycholinguistics for understanding human mind, brain and cognition: Prospects and Possibilities

Date: February 26, 2021 (Friday)

Time: 5 PM – 6.45 PM (NPT) (17.00 – 18.45) (Nepal Time is ahead of GMT: +5.45 Hours)

- 17.00 Opening Remarks by NTNU Alumni Nepal Chair Mr. Narayan Hari Rijal
- 17.05 Setting up of Cognitive Science and Psycholinguistics Lab in the Central Department of Linguistics, T. U. – Dr. Balaram Prasain, Associate Professor (now Professor) and Head, Central Department of Linguistics, T.U.
- 17.10 "What pointing gestures can tell us about early communicative development" – Prof. Mila Vulchanova & Dr. Valentin Vulchanov, Language Acquisition and Language Processing (LALP) Lab, NTNU
- 17.30 "Holding Keys and Playing With Fire: An Ongoing Exploration of Idiom Comprehension" – Dr. Evelyn A. Milburn, Language Acquisition and Language Processing (LALP) Lab, NTNU
- 17.50 "Prospects and Possibilities of Cognitive Science and Psycholinguistics in Nepal" – Lekhnath S Pathak, Cognitive Science and Psycholinguistics Lab, Central Department of Linguistics, Tribhuvan University, Kirtipur, Kathmandu.
- 18.10 "Cognitive Science and Psycholinguistics – Way Forward" – Prof. Dubi Nanda Dhakal, Assistant Dean, Faculty of Humanities and Social Sciences, Tribhuvan University, Nepal
- 18.15 Remarks by Royal Norwegian Embassy representative Mr. Jan-Erik Studsrød, Counsellor/Energy and Climate.
- 18.20 Remarks by NTNU Alumni Centrally representative
- 18.25 Remarks by Dr. Lava Deo Awasthi, Chairman, Language Commission, Nepal

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18.30 Question – Answer Session

18.45 Closing and Vote of Thanks

Moderator: Dr. Ajay Risal (Moderator), Dr. Biraj Singh Thapa (Co-Moderator)

Rapporteur: Mr. Pratik Bhandari and Ms. Sabita Rijal

Technical support: Mr. Indresh Kumar Thakur