

Revolutionizing Adult Foreign Language Acquisition: Integrating NLPs into Language Acquisition and Education.

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1. INTRODUCTION¹

1.1 Statement of Problem

In the United States, the study of a foreign language is seen as something mystical and not for the light-hearted within the wider culture, and even within academic circles such as universities. Studying a foreign language has a profound impact on the students that can achieve a high proficiency in their target language. This *acquisition* of a foreign language has various impacts on the student – ranging from job marketability², improved brain health and functionality³, and the widened knowledge of respective cultures and ability to connect to others outside of the native language⁴. The successful implementation of a robust pedagogical approach using new technologies that enhances students' ability to acquire foreign languages would benefit the many students that are looking to engage in a worthwhile vocation due to the internationalization of the United States economy. Furthermore, to deny students a pathway to reap the previously alluded to benefits would be detrimental to their work, understanding of various cultures and ways of life, and their own personal development and fulfillment. Thus, it is in our best interest to identify how individuals acquire language, and how new technologies help in that process.

1.2 Setting the Stage

Various theories have been hashed out and reexamined regarding the effective pedagogical methods in which foreign languages are both taught and how they are acquired. In

¹ Note: The citations on this page are not critical to the paper – but establish the importance of FLA. Thus, they are not included in the bibliography, but are cited in the footnotes (as to avoid plagiarism/making dubious claims).

² Kat Devlin (2018). Unlike in US, most European students are learning a foreign language in school while Americans lag. Pew Research Center Fact Tank.

³ Ping, Li., et al. (2013). Neuroplasticity As a Function of Second Language Learning: Anatomical Changes

in the Human Brain. ScienceDirect, Cortex., Vol. 58. 301-324.

⁴ Byram, Michael, et al. (2015). Culture and Foreign Language Education: Insights From Research and Implications for the Practice. *Deutsche Nationalbibliothek, Library of Congress*. Chapter 2.

this paper, we aim to define what it means to *acquire* a foreign language, and examine a recent explosion of interest in Natural Language Processors (NLPs) and their theoretical effects on the aforementioned. The term Natural Language Processing/Processors, or NLPs, is discussed and defined in section 2. The term *acquisition*, within the context of foreign language acquisition (FLA), is discussed and defined in section 3.

2. NATURAL LANGUAGE PROCESSING (NLPs)

2.1 History of NLPs

Natural Language Processing systems or NLPs (devices like Siri, Alexa, Google Assistant, ChatGPT, etc.) have a long standing history with its first showing in 1954 for the Georgetown demonstration (Hutchins, 2004). The international Business Machine corporation, known as IBM, had developed software ran on the IBM 701 mainframe capable of translating a select number of Russian sentences into English using a few grammar rules and a small vocabulary of just 250 words (Hutchins, 2004). This showing sparked interest in machine translation, and as technology advanced so did machines' capability of "understanding" human language. One of the issues with this rule based approach was the ambiguity of the language being interpreted. With the same word having multiple meanings, understanding the context of sentences was an important step to be taken for NLPs to see significant progress. The shift from rule based approaches to statistical models in the late 1980s was a big turning point in the NLP world because not only does it allow for *some* context to be taken into consideration, but it paralleled the advent of the internet, leading to a large increase in the amount of information that NLP systems could take in (Jones, 2019). These new statistical models allowed for the machines to mathematically determine what the most probable word to follow the previous word would be, and because of this it seemed like machines were able to take context into consideration. To help

handle these new models, systems began to use what is referred to as a neural network, as it was designed to mimic the functionality of the human brain by using a system of interconnected nodes that process and learn from information it receives (Jones, 2019). The first major neural network based architecture was also developed in the 1980s which was the recurrent neural network, also known as RNN (Google Translate is a more recent example of an RNN). RNNs operate in time, meaning prior outputs could be used when determining current outputs. This helps provide a sense of context to the NLP system which allowed for more accuracy when it was determining words. While these neural network architectures still rely on numerical processes in modern NLPs, there have been some changes to make it more reliable. The NLPs of today use what is known as deep learning neural networks which still uses lots of connections – only these new networks involve different layers to the connections that are being made. These deep learning networks are the underlying system framework for systems that function like Chat GPT that can give us human-like responses.

2.2 But What *Exactly* is an NLP?

Natural Language Processing is a section of Computer Science that is focused around a computer's understanding of human language, with the goal of creating the most natural interface between humans and computers in human language (Chowdhury et al., 2003). Essentially being able to speak to your device and it has the ability to recognize context, tone, and other nuances of the human language, and responds appropriately in a vocal manner. With access to the internet as well, it has more than enough information sources to draw from. Of course today's NLPs use deep learning networks that consist of complex layers of connections, and there are several different approaches to creating this network. The most common being the convolution neural network which is mostly used for image processing applications but can also

be used to layer word inputs into separate sections or windows, to produce what is called a feature map (Jones, 2019). These feature maps help narrow down potential meanings of the input and provide the final representation of the input. So essentially, all of the interpretation of the input is done in these feature maps after the words have been separated out. This information is then fed to what is called a polling layer which determines classifications of responses, before entering the output layer which pieces the response back together and creates the response that the user would receive.

2.3 Recent Advancements

Natural Language Processing plays a huge role in the development of AI systems that will interact with people in any situation. Without NLP, AI systems will not be able to receive human language as input or evaluate the language to produce an appropriate output. And the lack of AI systems vocally communicating with people on a day to day basis serves as proof that most NLPs are not functioning at a level of accuracy professionals are content with; but the use of NLPs in systems like Siri or more advanced systems such as Google's Gemini shows that forward progress is being made. Recently there have been several attempts to advance the deep learning models we currently use to help with understanding and production of human language that include pre-training techniques and multi-task learning models (Shah, 2020).

Pre-trained systems are similar to the rule-based systems from the first NLPs, only now these rules are incorporated into the modern complex neural network models in today's NLPs, meaning the system is not limited to only using these rules (Devlin et al., 2018). There are two ways this training is done, feature-based and fine-tuning training. Feature-based systems use task-specific structures to include certain representations that the NLP will not have to learn. The fine-tuning method gives more vague task-specific guidelines that are later turned into more

focused parameters for the NLP to follow. Despite the difference between the two training methods, they have the same final goal which is to use these unidirectional models to learn more general language representations (Devlin et al., 2018). But the process of training is not the new advancement, it is actually the direction that these pre-training methods allow the NLP to function in. They had only been capable of using these techniques in the direction the language would flow, which limits the system's ability to only look at the previous word. For example, a system using English would only be able to use their rules going from left to right in a sentence, and could only use the most recent word to best predict the following word. The newest pre-training techniques allow the system to work in a bilateral direction, so either left to right or right to left at any given time, which means the system can now use more than one word to predict the next word in a sentence (Devlin et al., 2018). With the ability to move back and forth between words in a sentence these deep learning systems now have access to larger model sizes which means faster learning, resulting in the average accuracy of word usage increasing to almost 95% from a little over 92% (Devlin et al., 2018). It is thought that accuracy is only a couple percent off from being able to put NLPs in positions where they would have to interact with humans constantly (positions like cashiers, call centers, fast food work, etc.) and avoid any major communication issues (Fanni et al., 2023).

The goal of multi-task learning models is to increase efficiency of learning and accuracy of predictions made by the NLP. It does this by making multiple predictions from one input, whether this is classification, units, scales, or meaning all at the same time instead of one at a time which is seen in single-task models (Kendall et al., 2018). The success of these predictions are measured by using a weight loss function. This function is essentially comparing the predicted output to the actual output to see how different they are (Janocha et al., 2018). The

closer the predicted output is to the actual output, the less loss we see, and the better the system is performing. Of course there is a training period for this, but once training is complete, we can compare multi-task systems to single-task systems to see how close the outputs are, and the speed at which they are produced. In order for this to increase efficiency, it must first be determined how much loss is acceptable for the return of time that results from this multi-task process. Afterall, if the outputs being produced are significantly different it may not be worth the time saved.

This is known as weighting loss terms and as long as the importance of the loss is properly weighted, an improvement in performance can be seen. When the multi-task models are combined with the deep learning architecture of the system, the multiple predictions being made become quicker and more accurate with more experience (Kendall et al., 2018).

2.4 Implications of Recent Advancements

The impressive progress being made in Natural Language Processing comes with some enhanced abilities over past AI systems. With the use of different learning models combined with deep learning architectures there are a number of software applications that will be able to better perform tasks like sentiment analysis (are people feeling positive or negative towards something), recognition of named entities, machine translation, text generation, and question answering (Shah, 2020). If NLPs reach a point where they are capable of identifying different parts of language with an extremely high accuracy, they could surpass the level of understanding of language that even native speakers possess. With this we would likely see an increase in AI systems maintaining positions that are heavily involved with human interaction and translation, such as an instructor of a foreign language.

3. FOREIGN LANGUAGE ACQUISITION (FLA)

3.1 Endless Theories and Variables

Various theories regarding the pedagogy of language teaching and, reflexively, student approaches to language learning have resulted in a wide landscape of approaches and conclusions. For instance, one of the many prevailing theories is that of interaction. Loewen et al., (2018) asserts that exposure to the target language (TL), their production of the language, and the interplay between the input and output in relation to cognitive differences among students are vital for language learning. Furthermore, Loewen states that there are various components which are integral to second language acquisition (SLA), which include input, comprehension, and language development. Loewen makes a particular point when discussing the input and output mechanism: there is a critical device by which input and output are vital – which is *negotiation*. The student must make requests for clarification, confirmation, and comprehension.

Another is that of engagement. Hiver et al., (2021) is a systematic review of 20 years of research on engagement and posits that student engagement is vital in the process of language learning – and that instructors must adapt to this and make language learning more engaging for students.

Dong et al., (2005) found that “almost all students attributed their success and failure to three unique causes” – for successful students: 1) teacher, 2) practice, and 3) their textbooks. For students that failed: 1) time management, 2) teacher, 3) interest, and 4) practice.

There is a wide array of research that academics have focused on – and the variables involved are seemingly endless. Erickson (2015) focuses on statistical learning⁵; Christiansen (2017) focuses on individual differences among students; Chengen (2020) focuses on emotions

⁵ Acquiring foreign language vocabulary simply by statistical volume. A sort of “law of large numbers” for *vocabulary* acquisition.

in SLA; and numerous other academics focus on other variables and methods. Given the multivariable and multi theoretical nature of FLA, we postulate that many of these variables are indeed valid parameters that influence student performance in acquiring a foreign language. For this paper, we aim to synthesize these aforementioned variables and theories with Stephen Krashen's various theories regarding language acquisition. These theories are not necessarily at odds either. Theoretically, all of them could provide explanatory power in regards to language acquisition. However, we believe that a synthesis of these variables, and the intuitively correct theory of Krashen, would supply the most robust modality in examining how NLPs can be used for language acquisition.

3.2 Stephen Krashen

Stephen Krashen, a popular American Linguist and Professor Emeritus at the University of Southern California, has had a massive influence on language acquisition theory. This influence mostly originates from his "5 hypotheses" – each of which attempt to explain how students acquire a foreign language.

3.3 Comprehensible Input (CI)

Three of Krashen's hypotheses regarding Comprehensible Input (CI) are necessary for understanding the overarching theme of Krashen's position – summarized by Schütz (2005). Firstly, Krashen's *acquisition learning hypothesis*. This theory centers itself around the *acquired* vs. *learned* system; Krashen states that acquisition is subconscious. Moreover, a critical component of the acquired system is 'meaningful interaction', wherein the learners are not, in Krashen's words, 'concentrated in the form of their utterances, but in the communicative act'. The learned system, on the other hand, is the 'product of formal instruction', which results in *conscious knowledge* about the language. In the opinion of Krashen, acquisition is more

important than learning. One can think of this as getting a joke *implicitly by subconscious means* versus having a joke explained in detail. For individuals that speak a foreign language, one can think of this as simply *internalizing* a given word or grammatical rule, rather than translating the word or having to consciously recall a given syntactical fact.

Secondly, Krashen's *Input Hypothesis* is his attempt to explain how a learner acquires a second language; mostly concerned with the acquisition system rather than the learned system. The hypothesis is the situation and condition in which the student improves and progresses along the 'natural order' – when he/she *receives input* that is slightly beyond his/her current stage of linguistic competence. Krashen asserts that the *natural communicative act* is the comprehensible input that allows the learner to acquire the language – in Krashen's view, *messages* are how we acquire language. This acquisition is, by Krashen, represented in mathematical form: ' $i + 1$ '⁶. This addition is going to be added through unconscious means that will add to the general competence of the learner. The addition could be a new word that is learned through context, or it could be a grammatical observation. Either results in a higher degree of acquisition in the TL.

Lastly, Krashen's *Affective Filter Hypothesis*. This theory asserts that a number of variables play a role in acquisition. These variables include motivation, self-confidence, and anxiety. Learners with high motivation, high self-confidence, and low anxiety are better equipped to acquire a foreign language – and the inverse is true. For the case of the inverse, Krashen states that an "affective filter" can be raised⁷, which prevents CI from being used for the acquisition of the TL. A learner cannot acquire a language if a learner does not have the requisite motivation to do so – this is something obvious. However, various psychological factors that are not necessarily obvious come into play as well, such as anxiety and self-esteem.

⁶ The current linguistic competence of the learner (i) + 1 (the additional comprehensible input).

⁷ Or, in layman's terms, a "mental block".

3.4 Synthesizing Krashen and Modern Theory

In section 3.1 many modern focuses on language acquisition and the relative variables and theories were examined. In section 3.3, the famous theories of Krashen were examined. For the sake of this paper, both sections will be seen as valid approaches to language acquisition – with the most robust model being a synthesis of both. This is not to say that Krashen’s theories are in direct opposition to the other theories presented, to the contrary – in the Affective Filter Hypothesis Krashen does indeed focus on individual differences among students (Christiansen), emotions (Chengchen), and engagement (Hiver). Further, Krashen’s idea of CI directly corresponds to the findings of Erickson with statistical learning. Krashen’s theories are not without criticism, however. Luo (2024), in response to the aforementioned models, states that a lack of clarity regarding the definitions of Krashen’s theory (such as acquisition vs. learning) hurts the theories validity. Moreover, Luo states that the role of input in Krashen’s input hypothesis is exaggerated. However, Luo states that the Affective Filter Hypothesis is the least controversial among Krashen’s hypotheses, and that “There does exist a consensus in the academic circle that anxiety, learning motivation, and self-confidence will affect SLA to some extent.” Although Luo provides a convincing counterargument to Krashen, the intuitive validity and accounts from many polyglots, such as Steve Kaufman⁸, make it very difficult to reject his hypotheses altogether.

4. THE IMPLICATIONS OF NLPs ON FLA

4.1 What do we Think?

We find ourselves in the position to possibly learn language at an unprecedented level from these AI systems. Regardless of whether students are using NLPs to assist with their native

⁸ For the interested in Steve Kaufman:
<https://www.youtube.com/watch?v=TKg23ZFURX0&t=1882s&pp=ygUiU3RldmUgS2F1Zm1hbiBhbmQgd2hhdCBpdmUgbGVhcm5lZA%3D%3D>

language or a foreign language, they could use these systems to teach them grammar, overall syntax, and semantics. Not only would students be able to see the written language but with NLPs but they could also hear proper pronunciation of words and repeat them back to the system to practice. An NLP system could be used to help individuals learn a language at their own pace, receiving specific lessons and material personalized to their level of the language (Pokrivcakova, 2019) – which directly correlates with the hypothesis of Krashen.

Given the scalability and speed at which these NLP systems can process and produce native level language, the totality of comprehensible input (that can be tuned to the students' given level of competence, ie, their “i”) is massive. These systems could *optimally* challenge the student (+ 1, not + 2) while teaching them the language, but still remain doable. But why not just watch many films and television shows in the TL, and acquire the comprehensible input that way? The issue with films and television as a means for comprehensible input is that the *messages* are not always clear. Furthermore, many times a native speaker will speak very quickly, and, in doing so, will jumble up words together to the point where it is not very comprehensible to the student. An NLP system, however, could work *in tandem* with film and television. Imagine a split-screen scenario.

On one screen, you can see an actor in a German film. He states “ich möchte essen”. The issue is that the relative *message* is not being conveyed by what the student sees on screen⁹. However, an NLP on the other screen could generate an image or video of what is being said, without using language, but by using a message (ie, a person showing that they are hungry, and wants to go eat). The student could furthermore ask for clarification, confirmation, and comprehension on the spot (as seen with Loewen).

⁹ The actor's face does not indicate the message he is attempting to convey.

NLP systems could also be used in classes by teachers as a tool to help with creating assignments, providing extra lessons, giving feedback to each student individually, or just to provide extra practice opportunities for students to have outside of class (Pokrivcakova, 2019). The new classroom environment in foreign language classes will be different if NLP systems are implemented into classrooms, and may be an adjustment for both students and faculty; but with the potential for each student to receive individual help in the specific area they are struggling with could help the students learn and stay engaged with the language (Schmidt et al., 2022).

One of the struggles of language learning in schools is that oftentimes the only exposure to the language students receive is during the class that teaches it. This leaves them with no one to practice with outside of the classroom and the language is simply not retained due to a lack of attention given to the content and a lack of repetition of the language. Usage of new skills are very important when it comes to creating long term memories, and NLPs could provide enough repetition of the language to help students learn.

4.1.2 [Sample Conversation](#) with OpenAI's Chat GPT-4.

As a demonstration, we tested Chat GPT with German. We asked what the word “Dünne” meant¹⁰, followed by asking Chat GPT to generate a photo using DALL-E¹¹. Erroneously, we think the word means “to cut”, but Chat GPT states that it is actually the word for “thin”¹². Chat GPT elaborates, in English, what the word “dünn” means. Furthermore, when we ask how we would use the word in a given context, it provides that as well¹³. Thus, not only now do we know the translation of the word, we have seen the word in context, with an image supporting it, and the message has been conveyed. Furthermore, we were able to instantaneously ask questions that

¹⁰ Direct translation.

¹¹ A method that enhances comprehensible input.

¹² Chat GPT performs Loewen's hypothesis in that it corrects us and provides clarification.

¹³ Reinforces our comprehension by supplying us a use-case.

relate to comprehension, clarification, and confirmation regarding the given vocabulary and concept.

As the sample conversation with Chat GPT shows, one can employ the various techniques of pedagogical methodology for FLA that not only the modern theory suggests is vital but also what Krashen states is vital – these NLPs (such as Chat GPT) can assist in motivation, comprehensible input, images, video (a technology like Open AI's Sora), engagement, clarification, etc. and does all of this with the efficiency, speed, and scalability of Artificial Intelligence using NLP as a spine. For instance, with technologies such as Sora, NLPs could, theoretically, employ perfect CI in the form of video and film. They could, as it were, create the perfect CI for a given student in the sense that the NLP would know the level of the student and create scenarios in video form that provide the next level (+ 1) in a scale and optimizational fashion that is unprecedented. As mentioned previously, sometimes the *mise en scène* in film does not correspond 1 to 1 with the dialogue. However, with the aforementioned technologies, this would be possible – on every student level – and done in a fast manner, where, if a student has a question, the NLP can assist them, without the typical downfalls of human instructors¹⁴.

4.3 Literature Regarding the Synthesis of NLPs and FLA

There seems to be a general consensus among researchers: AI, which involves NLPs (as AI needs a system by which they can comprehend language), would be revolutionary to the field of FLA.

For instance, Han et al., (2022) examined AI and teacher interaction, and also touched on the impact that AI chat bots could and do have on students. The article suggests that AI can present learners with “authentic videos” that enhance “their lexical and structural competency”, that AI “improved phonological awareness during oral and writing exercises”, enhanced and

¹⁴ Human instructors must sleep, take their time to assist, etc.

provided diagnostic information regarding students' vocabulary level, adjusted its proficiency level and "offered adaptive feedback based on the evaluations it made".

Moreover, the AI "tailored instructions based on the learners specific needs", and, most importantly, "both chat bots employed NLP and human-like intelligence, allowing participants to receive acceptable comprehensible input and produce multiple foreign language outputs". Furthermore, the article suggests that AI could have positive impacts on students' psychology: reducing language-learning anxiety, increasing their willingness to communicate, increasing language interest and their self-efficacy in their language courses.

However, Han notes some drawbacks, particularly that AI had the tendency to have communication breakdowns – and further that AI had a lack of immersion. Moreover, AI was unable to fully match the topical interests of the student and some emotional needs. The study noted that there is great possibility for AI, but the human teacher and AI collaboration left much to be desired. It asserts that human teachers still need to be present to maintain learner interest and to provide support and empathy in social interactions.

Moorhouse., et al (2023) found similar results with OpenAI's Chat GPT. The article states "Chat GPT supports language learning by stimulating authentic interactions. It can identify the meaning of a word in context, correct and explain language mistakes, create texts in various genres, develop quizzes, annotate texts, and offer dictionary definitions, example sentences, and translations". Moreover, the authors state that Chat GPT can adjust the complexity of the dialogue to make it more comprehensible and beneficial for the student. The authors also state that, given Chat GPT's nature, it can provide "rich linguistic input and daily conversational practice", that allows it to engage the students, enhance their linguistic capabilities, sustain motivation, diminish shyness, provide personalized learning materials, and even suggest

customized learning paths tailored to the student. Furthermore, the authors make a note that Chat GPT can also “provide a range of expressions, questions, and vocabulary which human language partners may lack, and facilitate an authentic, interactive language-learning environment”. This authentic nature of Chat GPT’s outputs will provide the student with pure, native-level comprehensible input.

Zhai et al., (2023) provided a systematic review of AI systems for enhancing English acquisition. The review identified six dimensions that influence the application of AI dialogue systems for EFL learning: 1) Technological integration, 2) Task designs, 3) Student engagement, 4) Learning objectives, 5) Technological limitations, and 6) The novelty effect. The findings indicate that AI dialogue systems serve as a communicative role for EFL acquisition. These AI dialogue systems also reduced students’ speaking anxiety, enhanced their vocabulary retention, and offered immediate feedback to boost their willingness to interact in the TL. Moreover, the researchers note that audio lingual methods can be beneficial for word recognition, which directly helps vocabulary acquisition, which directly correlates with proper vocabulary usage¹⁵.

However, a limitation was identified: not all anxiety relating to foreign language speaking was alleviated in each student. The researchers note that this is an issue that seems highly difficult to get rid of.

5. SYNTHESIS OF IMPLICATIONS AND LITERATURE

5.1 Commonalities

There were many commonalities between the implications we hypothesized regarding the use of AI/NLPs in FLA and what researchers in the field have also identified. The most

¹⁵ There is also much talk of phonics education in native language acquisition for students. I.e, the less the teachers focus on phonics, the worse children do in reading and writing as they develop.

important to our system of language acquisition that synthesizes the modern theory and Krashen's is that of CI. Both us and the researchers in the field posit that AI/NLPs can and would increase the depth and breadth of the quality of CI. This was mostly shown by our demonstration of Chat GPT and Moorhouse's demonstration of Chat GPT. These AIs, as both we and the researchers have identified, improve CI. For instance, Moorhouse states that Chat GPT provides "rich linguistic input and conversational practice", and that it supports authentic interactions, which are both necessary for language acquisition, particularly in Krashian fashion. In relation to CI, the researchers, like us, also identified the *video* aspect of NLPs and AI. The researchers suggested that authentic videos enhance lexical and structural competency. We both identified the possible impact and implications on spoken language: Moorhouse indicated that these chatbots improved "phonological awareness during oral and writing exercises".

As it pertains to Krashen's Affective Filter Hypothesis, both we and the researchers believe that (and the researchers show) AI's effects on psychological dimensions of FLA are positive: these chatbots/AI/NLPs improve motivation, engagement (Hiver), increased amount of practice outside of the classroom and increased exposure to the foreign language from interaction with AI (the statistical learning supported by Erickson), tailored individual feedback (that adapts to the linguistic capabilities of the student), optimized challenges, learning at the student's level and pace, and the relationship between human teacher and AI (scalability of assignment creation, grading, lessons). Furthermore, the researchers touched on the AI's ability to provide dictionary level translation and provide corrections with explanations on the fly, which relates greatly to Loewen's hypothesis of clarification, confirmation, and comprehension.

5.2 Differences

The areas in which we differ from the researchers are the modalities and implications in which we did not anticipate. These include the drawbacks of AI systems and their collaborative effectiveness with human teachers (Moorhouse discusses the AI's tendency to breakdown in communication, the lack of AI's ability to maintain a topical interest of the student, some emotional needs that were not met (such as certain social needs), and overall a general sense that there is much to be desired in this collaborative effort).

Moreover, we did not consider the possibility of diagnostics on students from the AI, such as vocabulary level and the AI's assessment, in the form of diagnostics, of student ability. We also did not anticipate specific effects on student psychology, such as a reduction in anxiety (that the AI's were able to diminish, but the researchers state is a very, very difficult road to get perfect), the students willingness to communicate, their level of shyness, and the idea that the AI's can increase student interest in their TL and their self-efficacy in the classroom. Furthermore, we eschewed the problem of how one would integrate this technology into the classroom in a more effective manner.

6. DISCUSSION

This paper has explored the possible and theoretical impact and implications of Natural Language Processing (NLP) technologies on foreign language acquisition (FLA). Our investigation of the available literature concerning both FLA and NSPs reveals that NSP tools, such as AI-driven chat bots (such as Chat GPT-4, Gemini, etc) and language learning platforms can provide students that are studying a foreign language with highly personalized, interactive, highly comprehensible learning experiences. These aforementioned NLP technologies are

absolutely brimming with the potential to reshape the sphere of language learning and acquisition entirely.

The integration of NLP into language learning and education can significantly automate, both qualitatively and quantitatively, Krashen's idea of comprehensible input (CI). These NLPs essentially are the perfect candidate for the theories of Krashen and other researchers in the field: they can match the students' current proficiency level, and optimize their instruction and level such that the student, in turn, receives the most fine-tuned CI, something that goes far and beyond the alternative method of receiving CI, which would be ingesting native speech and writing (such as watching a film or reading in the TL). However, our review of the literature does indicate that there are hurdles to be overcome. Namely, there is still a role for the human in language education. The nuances of cultural context, emotional support, and facilitation of human social interactions remains a pitfall for NLPs, where human educators outperform these technologies.

This paper takes into consideration the empirical and theoretical power that NLPs could (and seemingly do) have in the field of FLA whilst also considering the drawbacks of such technologies. Given these drawbacks and to further inquiry, we suggest that future research be dedicated to NLPs and FLA, specifically in the following domains:

- 1) We suggest that researchers focus on these aforementioned technologies in the applicative manner of film and media. To answer this question and see the impact of Krashen's idea of CI in film and media on students' acquisition of their TL would be greatly informative and would guide more research into the far future. Specifically, we would like to approach the previously mentioned "perfect CI" – in a system that was partially described by the split-screen example found in section 4.1. If Krashen's theory is correct, and AI is

able to, through both scale and speed, create and distribute meaningful messages via film and media, research can be allocated to the impact of such a method.

- 2) We suggest that researchers focus on the psychological impacts of these technologies on not only the students but also on the human instructors. This would allow us to identify *how* and *why* there seems to be an impact on issues such as anxiety, motivation, and engagement. Once the how and why are identified, researchers in Computer Science and other related fields can further optimize the technologies such that there are massive gains in the aforementioned issues – something that, according to Krashen, would lower the “Affective Filter”, and thus lead to more overall gains in acquisition.
- 3) We also suggest that researchers focus on the most effective, efficient, and seamless integration of these technologies into the classroom, and take into account the empirical findings suggesting that there are bottlenecks in the collaborative efforts of NLP systems and human instructors.

7. CONCLUSION

In conclusion, the advent and continual advancement of NLP and AI related technologies will (we believe) usher in a new era in foreign language acquisition (FLA) in an unprecedented fashion in both quantitative and qualitative dimensions. These technologies have the potential to provide students of foreign languages with personalized, engaging, and effective FLA modalities – allowing both the students and instructors to benefit. Our analysis supports the integration of NLP systems and tools into the classroom and learning curriculum – and we suggest that such an ontological shift in the traditional language education paradigm would thus result in *significant* improvements in language acquisition among adults (with implications for children, also). This would be accomplished, primarily, according to our robust model for FLA, through:

1) Enhanced, approaching perfect CI, 2) A reduction in harmful pathologies (anxiety, shyness) in the learning environment, and 3) An increase in beneficial psychological states (motivation, engagement, self-esteem) – all of which would enable more effective and efficient FLA.

However, it is imperative to mention that the integration of NLP technologies into the learning environment is a nuanced topic. The capabilities and limitations must be understood so that the actual implementation and application of these technologies are the most effective and efficient they can be. The optimal use of NLPs in the classroom is likely a model that synthesizes AI and human instruction that provide a deep, engaging learning experience for students.

Ultimately, the integration of NLP technologies into FLA represents an unprecedented pioneering in language education. It is absolutely critical that these technologies are developed (for the sake of FLA), with the linguistic theories and empirical evidence in mind. It is pivotal that we promote the strengths of these systems and mitigate, or even eliminate, their limitations. If such an integration is possible, the quality and effectiveness of FLA would increase exponentially, and perhaps finally lead to solving the issues regarding language learning and pedagogy, making success in this domain more accessible, engaging, and effective for students.

APPENDIX

Chat GPT-4 Conversation. [Return](#)

You
Dankeschön! Aber was bedeutet "Dünne"?

ChatGPT
"Dünn" bezeichnet etwas mit geringer Dicke oder Feinheit. Wenn wir über "dünne Scheiben" oder "dünne Streifen" von Fleisch sprechen, meinen wir Fleischstücke, die sehr fein oder schmal geschnitten sind. Diese Art des Schneidens wird oft verwendet, um die Garzeit zu verkürzen, die Zärtlichkeit und die Aufnahme von Marinaden oder Gewürzen zu verbessern. Es kann auch eine ästhetische Wahl sein, um das Gericht ansprechender zu präsentieren. In der Küche kann "dünn" auch bedeuten, dass etwas leicht oder nicht zu reichhaltig ist, was auf die allgemeine Beschaffenheit oder den Geschmack eines Gerichts hinweist.

You
Kannst du ein foto machen, so ich kann verstehen es besser?

ChatGPT



Hier ist ein Bild, das zeigt, wie ein Stück Rindfleisch dünn geschnitten wird. Wie Sie sehen können, werden die Fleischstücke sehr fein und schmal geschnitten. Diese Technik hilft, die Garzeit zu verkürzen und ermöglicht es dem Fleisch, Marinaden und Gewürze besser aufzunehmen.

You
Ah, so "dünne" ist "cutting" auf Englisch?



You

Kannst du dass auf Englisch sagen?



ChatGPT

Certainly! The German word "dünn" describes the thickness or fineness of an object and translates to "thin" in English. The verb "schneiden" in German means "to cut" or "to slice" in English, depending on how and what is being cut. So, when we talk about "dünne Scheiben," the English translation would be "thin slices." And the act of cutting in this context would be referred to as "cutting" or "slicing" in English.



You

Ach so, wir machen die Fleisch dünner?

How would I say that "we cut the meat thinner"?



ChatGPT

In English, you would say, "We cut the meat thinner." This phrase implies that you're reducing the thickness of the meat by slicing it into finer pieces.



You

Auf Deutsch, bitte.



ChatGPT

Auf Deutsch würden Sie sagen: "Wir schneiden das Fleisch dünner."

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