Neutrino-nucleus scattering is a process vital to neutrino oscillation experiments. We study semi-inclusive interactions where one muon and one proton are observed in the final state. The residual nuclear system remains unobserved which results in a kinematic imbalance. The goal is to then construct the missing kinematics and reconstruct the neutrino energy. We compare different theoretical approaches, including the effects of distorted waves, spectral functions, optical potentials, and nucleon rescattering. We provide analysis of the recent data from MicroBooNE and study observables measurable in Liquid Argon Time Projection Chambers (LArTPC). We find, by comparing calculations with realistic spectral functions for different nuclei, that observables, in the MicroBooNE experiment, are indistinguishable with the current experimental precision. We applied an Intra-Nuclear Cascade (INC) model from the NEUT event generator to Relativistic Distorted Wave Impulse Approximation (RDWIA) and Relativistic Plane Wave Impulse Approximation (RPWIA) calculations for ^{40}Ar. The Relativistic Optical Potential (ROP) we use under-predicts the MicroBooNE data significantly suggesting inelastic Final-State Interactions (FSI) contribute, and this is shown with a comparison with INC models that only include elastic interactions. Additionally, we find that distorted wave calculations feature a significant reduction in the observables compared to plane wave calculations. These differences remain even after applying an INC model. After cascades, both under-predict the data but yield the correct shape in most cases. Some discrepancies can be due to only considering Quasielastic interactions, which means that the energy-momentum transfer is small relative to the incident neutrino. It is expected at higher missing momentum that non-Quasielastic effects become important, but we find under-predictions at low missing momentum as well, suggesting that there are contributions to the data that are not accounted for.