```python
# Prompt user for input
n = get_integer_input("Enter a number: ")

# Initialize an empty list to store prime numbers
primes = []

# Loop through each number from 2 to n
for num in range(2, n+1):

    # Assume the number is prime until proven otherwise
    is_prime = True

    # Check if num is divisible by any number between 2 and num-1
    for divisor in range(2, num):
        if num % divisor == 0:
            is_prime = False
            break

    # If the number is prime, add it to the list
    if is_prime:
        primes.append(num)

# Display the list of prime numbers
print("The prime numbers up to", n, "are:", primes)
```

Algorithmic Efficiency: $O(n^2)$

Trace Table for n = 10:

i	j	i is prime?	Action
2		Yes	Add 2 to array of primes
3	2	Yes	
		Yes	Add 3 to array of primes
4	2	No	
5	2	Yes	
		Yes	Add 5 to array of primes
6	2	No	
7	2	Yes	

		Yes	Add 7 to array of primes	
8	2	No		
9	2	Yes		
		No		
10	2	No		

Array of primes: [2, 3, 5, 7]