```python
class BankAccount:
    def __init__(self, account_number, account_holder_name, initial_balance=0.0):
        self.__account_number = account_number
        self.__account_holder_name = account_holder_name
        self.__account_balance = initial_balance

    def deposit(self, amount):
        if amount > 0:
            self.__account_balance += amount
            print(f"Deposited ${amount:.2f} into account {self.__account_number}")
        else:
            print("Invalid deposit amount. Please deposit a positive amount.")

    def withdraw(self, amount):
        if amount > 0:
            if self.__account_balance >= amount:
                self.__account_balance -= amount
                print(f"Withdrew ${amount:.2f} from account {self.__account_number}")
            else:
                print("Insufficient balance. Cannot withdraw.")
        else:
            print("Invalid withdrawal amount. Please withdraw a positive amount.")

    def display_balance(self):
        print(f"Account {self.__account_number} balance: ${self.__account_balance:.2f}")

if __name__ == "__main__":
    account1 = BankAccount("123456", "John Doe", 1000.0)
    account1.deposit(500.0)
    account1.withdraw(200.0)
```

```
account1.display_balance()
```